Toshiba SA-500

TOSHIBA SOLID STATE AM/FM STEREO RECEIVER SERVICE DATA

FILE NO. 170-001

Pure Complementary
Direct-coupled Output Condenser Less
MOS FET FM Tuner
With Condenser Cartridge Amp
MFR

MODEL SA-500

TOKYO SHIBAURA ELECTRIC CO., LTD.
2-1, 5-CHOME, GINZA, CHUO-KU, TOKYO, JAPAN

Toshiba SA-500

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SPECIFICATIONS

AUDIO SECTION

Total IHF music power output	90W (8 ohms) 145W (4 ohms)
Total r.m.s. continuous power output	
Each channel driven	35W x 2 (8ohm, 1KHz) 50W x 2 (4ohm, 1KHz)
Both channel driven	30W + 30W (8ohm, 1KHz) 40W + 40W (4ohm, 1KHz)
Harmonic distortion	0.4% (35W 1 KHz)
Intermodulation distortion	0.4% (35W 1 KHz)
Frequency response	10Hz~55KHz (within +1dB, -3dB)
Power band width (IHF)	10Hz~40KHz

	Input sensitivity	input impedance	Signal-to-Noise ratio
PHONO MAG	2.5mV	47Kohm	65dB
CC	30mV	70Kohm	70dB
AUX	150mV	100Kohm	75dB
TAPE PLAY	150mV	100Kohm	
MAIN IN	550mV	47Kohm	

Channel separation	-45dB (at 1KHz, rated power output)
Recording output level:	
US PIN	150mV
DIN	30mV
Residual noise	Less than 1.5mV
MFR controls:	Bass 100Hz±10dB(VS.1KHz) Treble 10KHz±10dB (VS.1KHz)
Loudness:	+10dB (100Hz), +4dB(10KHz)
Damping factor:	20 (8 ohm)
Acceptable speaker impedance:	4~16 ohm

FM TUNER SECTION

Sensitivity (IHF)	1.8μV
Distortion:	0.3% (400Hz, MOD,100% Monoaural) 0.5% (400Hz, MOD,100% Stereo)
Signal-to-Noise ratio:	66dB
Frequency response	20Hz~15KHz (within±1dB)
Selectivity (IHF)	80dB
Image ratio	80dB
IF rejection	80dB
Capture ratio	1.5dB
Spurious rejection:	100dB
AM suppression:	46dB
FM Stereo Separation:	35dB (at 400Hz)

AM TUNER SECTION

Sensitivity:	15μV (IHF)
Distortion:	1%
Image suppression	70dB
IF suppression:	65dB
Signal-to-Noise ratio:	50dB
Selectivity	25dB (±100KHz)

GENERAL

Semiconductors:	IC 3 FET 3 Transistor 51 Diode 30
Supply voltage:	100/117(120)/220/240V 50/60Hz
Power consumption:	125W
Dimension:	17-1/2(W) x 15(D) x 4-1/2(H) inch
Weight:	21 LBS

VOLTAGE ADJUSTMENT

Insert the pin, adjusting the arrow in the direction of the power supply voltage applied.

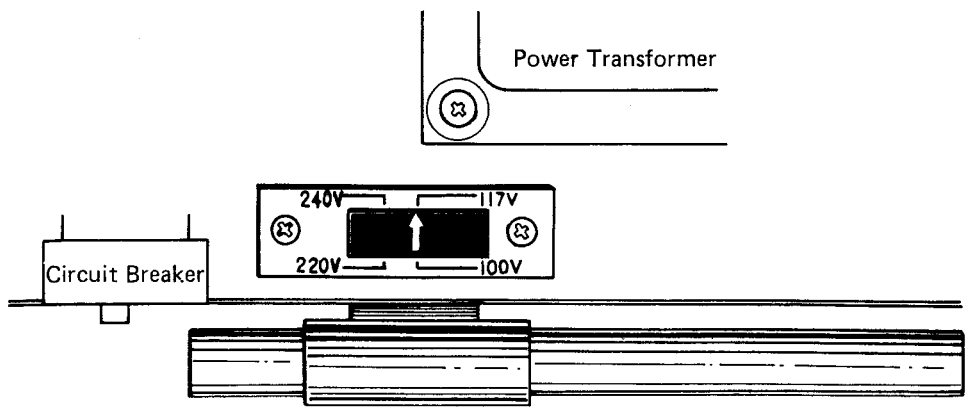


Figure 1

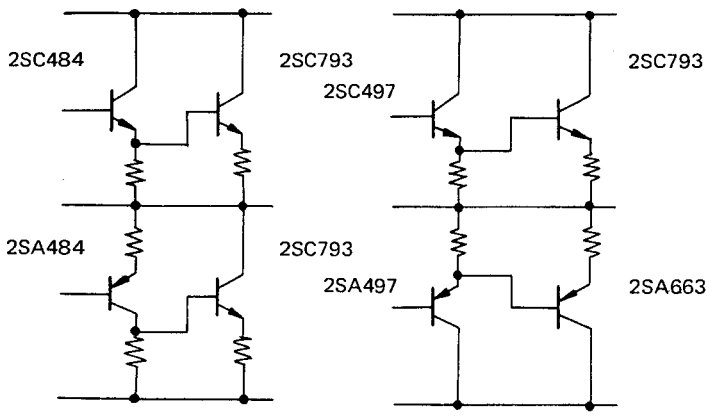
TECHNICAL POINTS

1. PURE COMPLEMENTARY CIRCUIT SYSTEM

The difference between the Pure Complementary Circuit and the Quasi Complementary Circuit is that the Darlington connections in the lower part are, as shown in the figure below, connected to PNP-NPN for the Quasi Complementary Circuit and to PNP-PNP for the Pure Complementary Circuit.This difference results in the cross-over distortion in the unit. Although the switching distortion is inevitable with B class P-P amplifier, the Pure Complementary Circuit, where both upper and lower transistors are symmetrical each other, these distortions are canceled each other and the action similar to A class action is provided.

This can be afforded only with the newly developed PNP transistors, 2SA663, which are produced by the Toshiba's semiconductor manufacturing technology.

The distortion can be kept under 0.1% even with 10 KHz at rated output and PBW is also greatly improved with the use of this transistor.



Quasi Complementary Circuit (SA-20, SA-15)

Pure Complementary Circuit (SA-500)

2. DIRECT-COUPLING OUTPUT CAPACITOR LESS CIRCUIT SYSTEM

The following features are available by adopting the Output Capacitor Less of the direct-coupling two-power source system:

(1) Stable extension of frequency characteristic to the ultra low frequency range becomes possible.

(2) The output impedance (Damping Factor) does not vary even in the ultra low frequency range.

This feature together with the Pure Complementary Circuit system mentioned above is regarded as the one for the most ultimate and perfect amplifier today.

The most serious problems with the direct-coupling amplifier are the DC drift due to the temperature variation and the possibility of the occurrence of excess direct current to the speaker, which is caused by the transient shock at the moment of switching on the power supply and the unlikely break of the power transistors. In the model SA-500, these problems are resolved in such ways as follows: A differential amplifier consisting of the transistors of high current amplification factor, HFE, is incorporated in this unit in order to raise its DC stability. This shock at the moment of supply of power is reduced to some extent by inserting the twin-T type filter in the unit.

The speaker is safely protected against unlikely accident of transistor break by incorporating the circuit breaker between the speaker terminal and output circuit. On the contrary, in the case of shorting of the speaker terminal, the output circuit is protected by the circuit breaker built-in.

3. BUILT-IN SPECIAL AMPLIFIER FOR CONDENSER-CARTRIDGE

See SB-404 Technical Notes.

4. MULTI-FREQUENCY RESPONSER, (MFR)

See SB-404 Technical Notes.

Since the tone control of NF type is furnished in SA-500, tone undulation at the medium tone is almost negligible.

5. HIGH-PERFORMANCE FM TUNER

This is a high-performance tuner with ST-500 tuner built-in. For details refer to ST-500 Technical Notes.

6. CONNECTION FOR 4-CHANNEL ADAPTER

You can easily enjoy the contrast between 2-channel and 4-channel by using 2-ch/4-ch adapter switch located in the front panel and by connecting this amplifier to the QM decoder (Model No. SC-410).

For details refer to the instruction manual for 4-channel adapter.

MECHANICAL DISASSEMBLIES

CABINET, CHASSIS DISASSEMBLIES

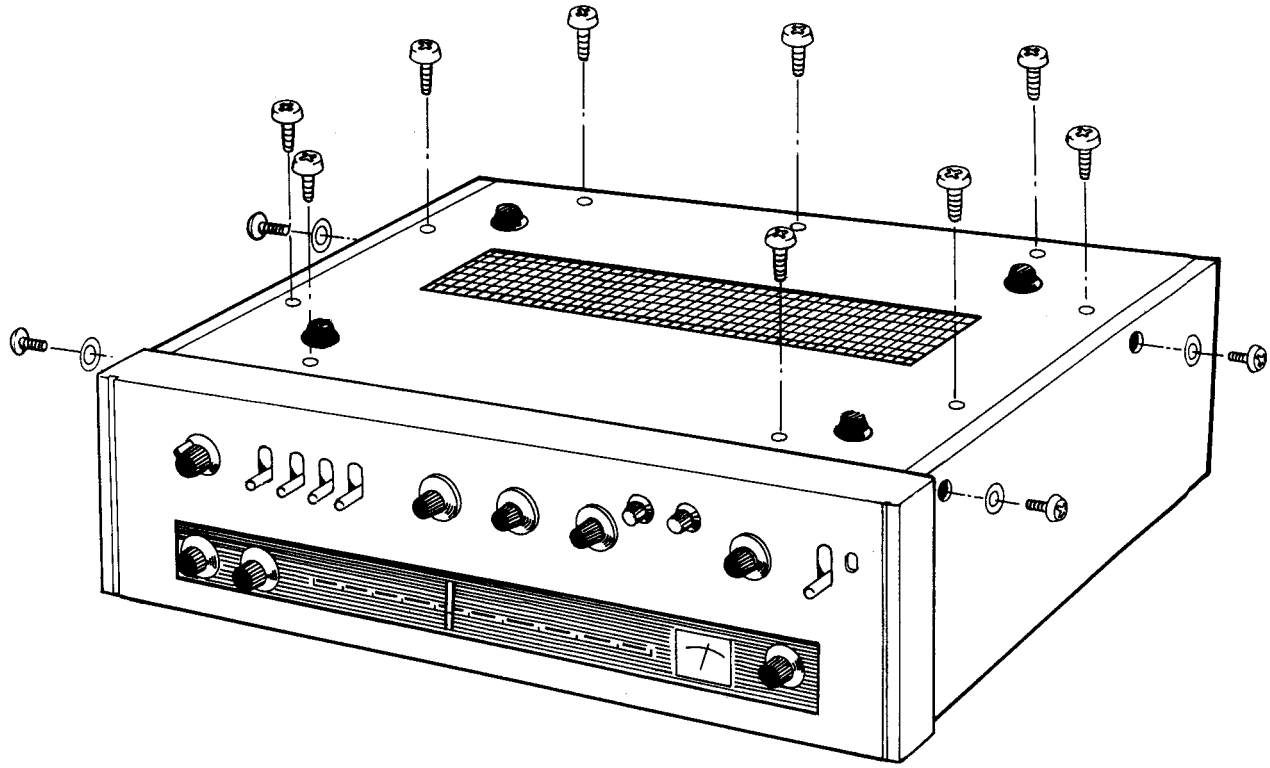


Figure 2

TONE PC BOARD DISSASSEMBLY

1. Pull out knobs.
2. Remove the Panel mounting screws (2 used).
3. Take out the Front Panel.
4. Remove the bracket mounting screws (5 used). (See Fig. 3)
5. Take off the Tone PC board.

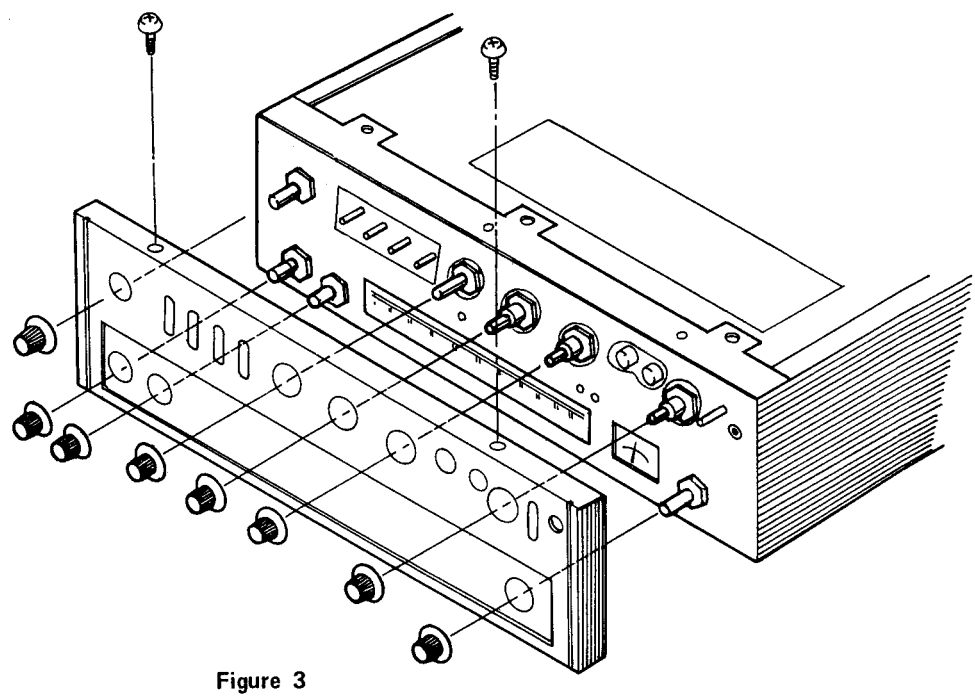
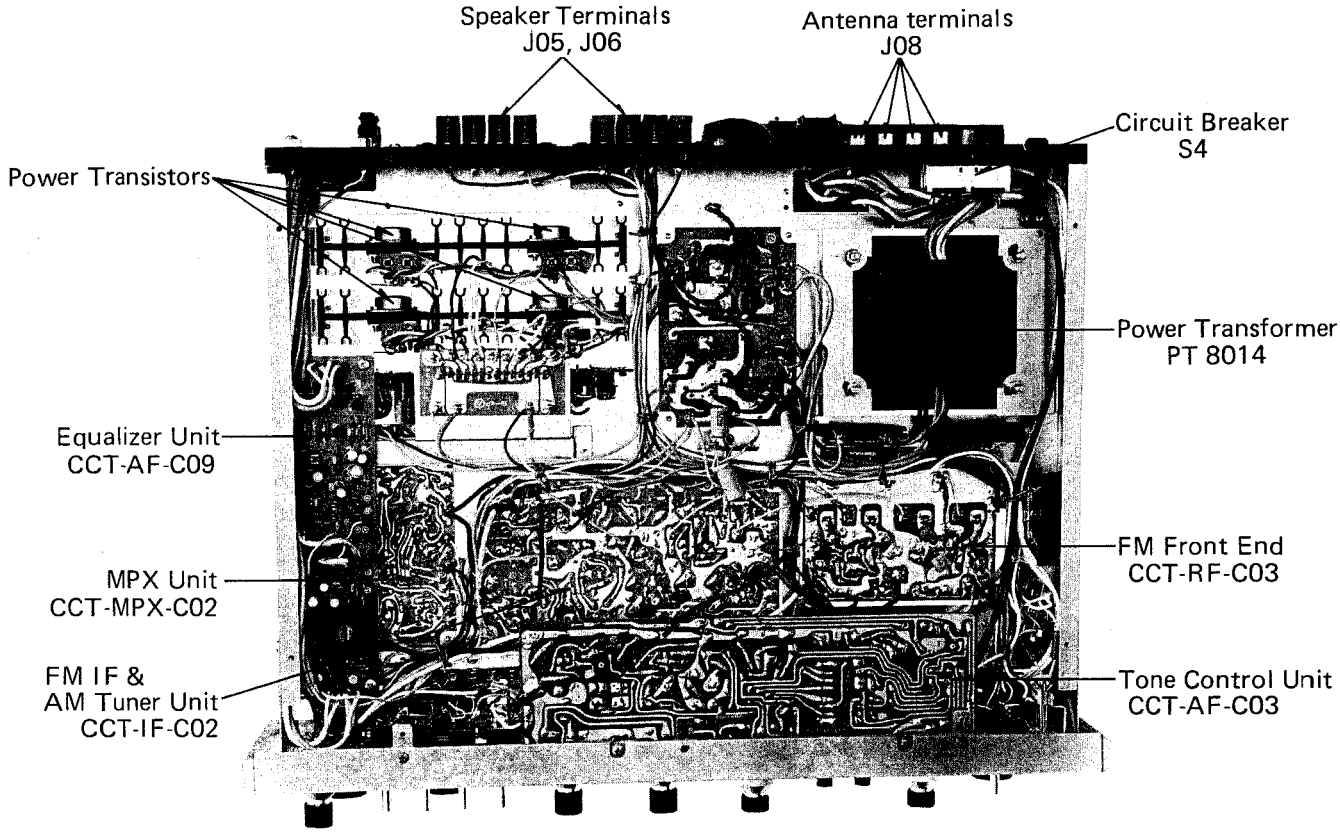
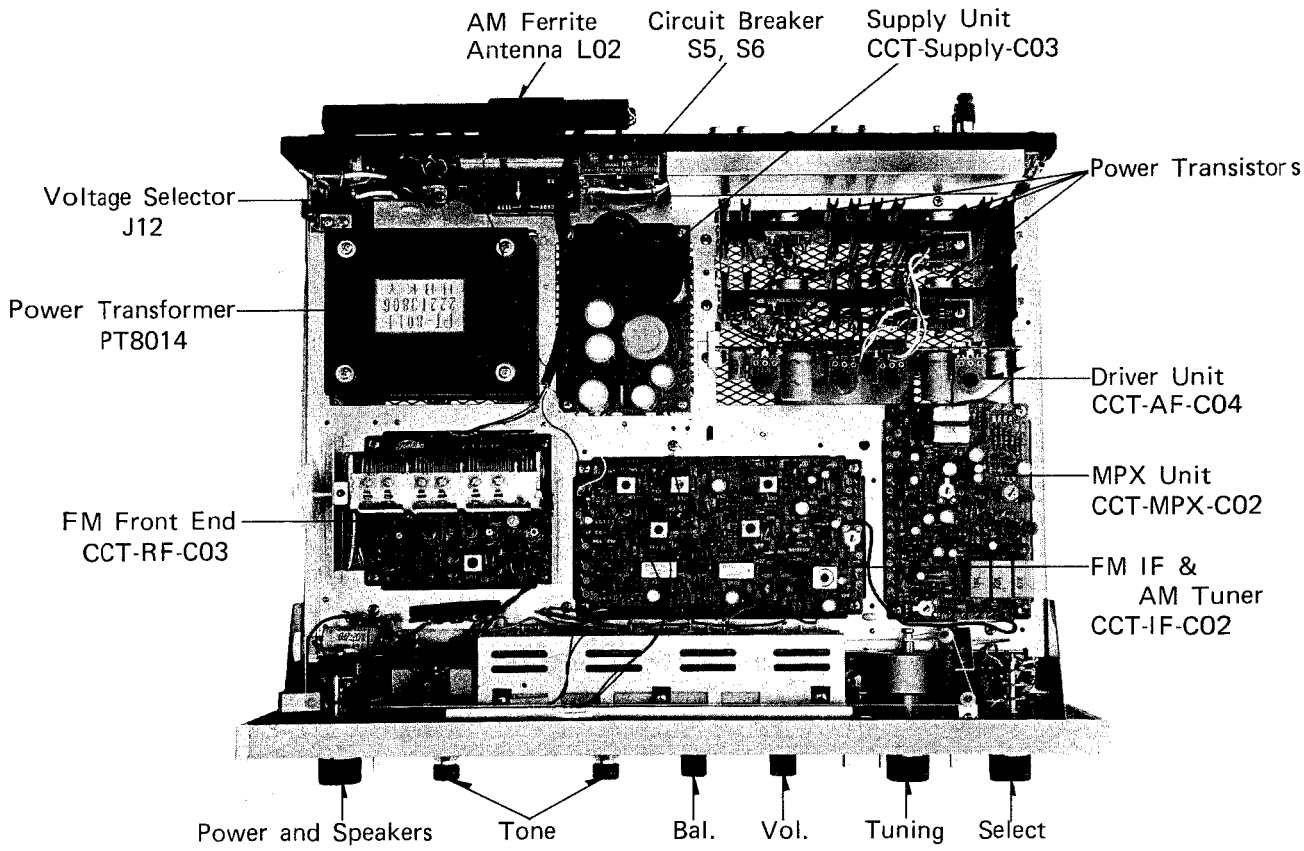


Figure 3



CHASSIS BOTTOM VIEW



CHASSIS TOP VIEW

ADJUSTMENTS

CAUTION:

Never short-circuit the speaker terminal.

When a strong input is fed to the speaker or the speaker terminal is short-circuited, the output circuit is protected against the possible damage through the function of the protection circuit.

After the protection circuit worked, push the protector reset button located on the rear panel.

AUDIO SECTION

Equipment:

1. Multimeter
2. Audio Generator
3. Oscilloscope
4. Electronic Voltmeter (AC-VTVM)

MAIN AMP BIAS ADJUSTMENT (See Fig. 4)

	STEP	ADJUSTMENT	REMARKS
1	Center Potential Balance	VR01,VR02 (300 Kohm Potentiometer)	Adjust for 13, 14 = 0 volt. (or Speaker terminal)
2	IC idle Adjustment	VR03,V04 (500 ohm Potentiometer)	Adjust for Ve=0.02 Volts, TR15 or TR16

Note:

VR01-04 should be preset to the mid-position before adjustment.

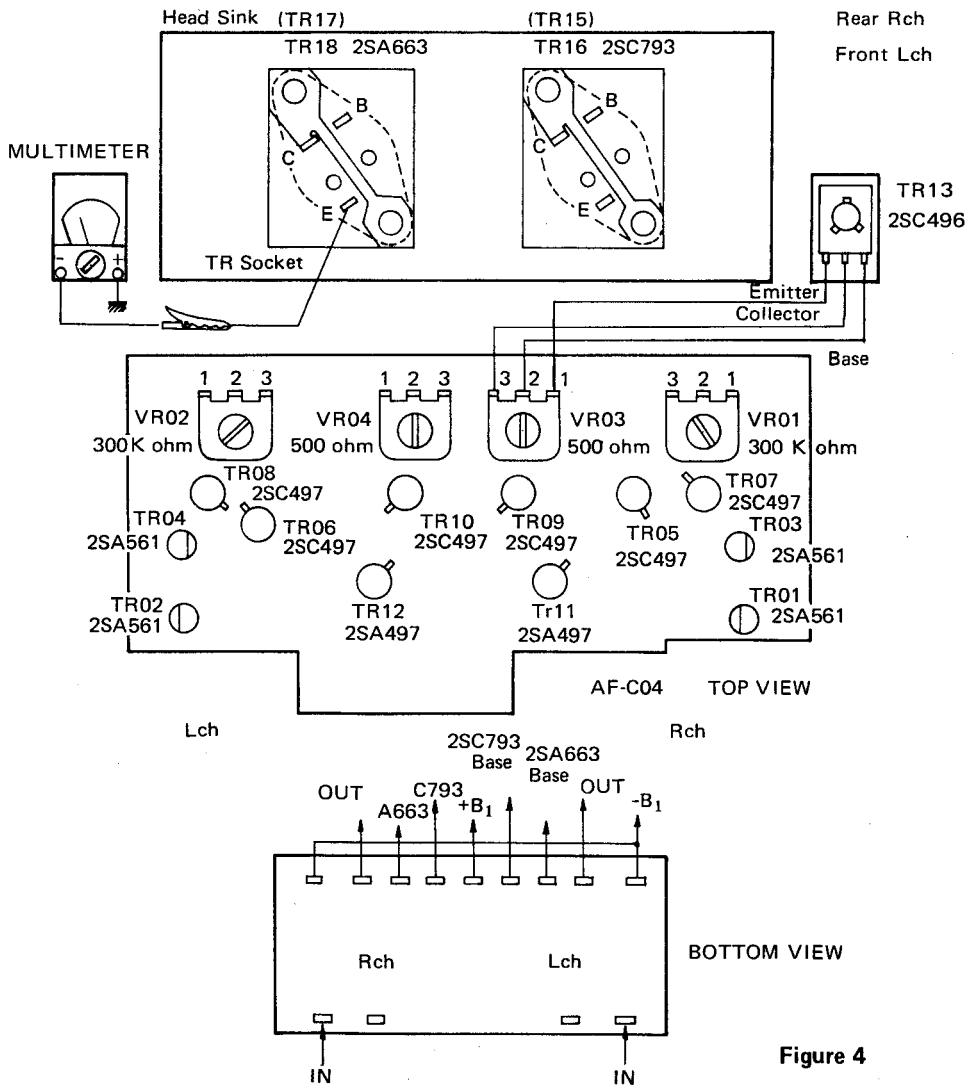


Figure 4

AM TUNER SECTION

Equipment:

1. SG (Signal Generator)
2. SG (Sweep Generator)
3. Test loop antenna (50 ohm)
4. Load (dummy load 8ohm or speaker 8ohm)
5. VTVM (AC)
6. Adjusting screw driver
7. Adjusting screw driver (use to antenna core)
8. Oscilloscope

AM ADJUSTMENT SETUP

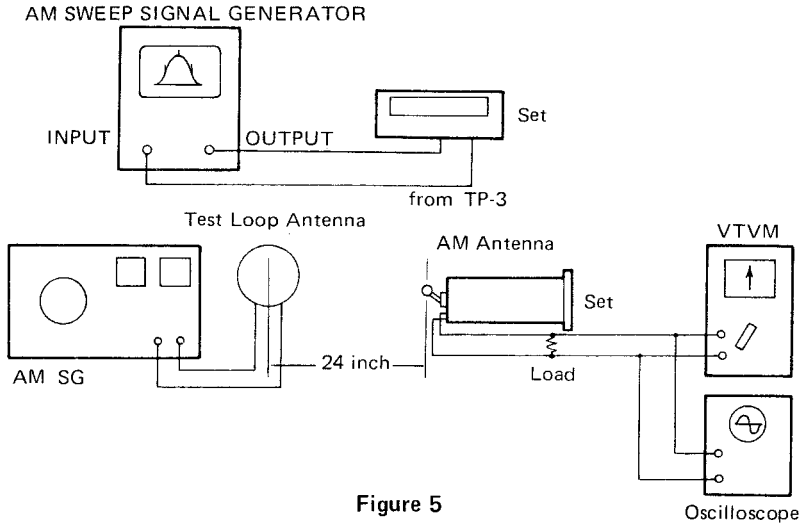


Figure 5

Note 1. Make adjustment of the AM tuner section with the minimum input signal possible to the set.

Note 2. It is not always necessary to set the IF center frequency to 455 KHz as its range is determined by the ceramic filter used. Center frequency is within 455 ±2 KHz.

AM IF ADJUSTMENT PROCEDURE

STEP	ADJUSTMENT	REMARKS
IF Response	IF-C02 IT02, IT01 IF Transformer	Adjust for scope pattern with specified marker (455KHz) as illustrated in Fig 5.

AM ADJUSTMENT PROCEDURE (See Fig. 5)

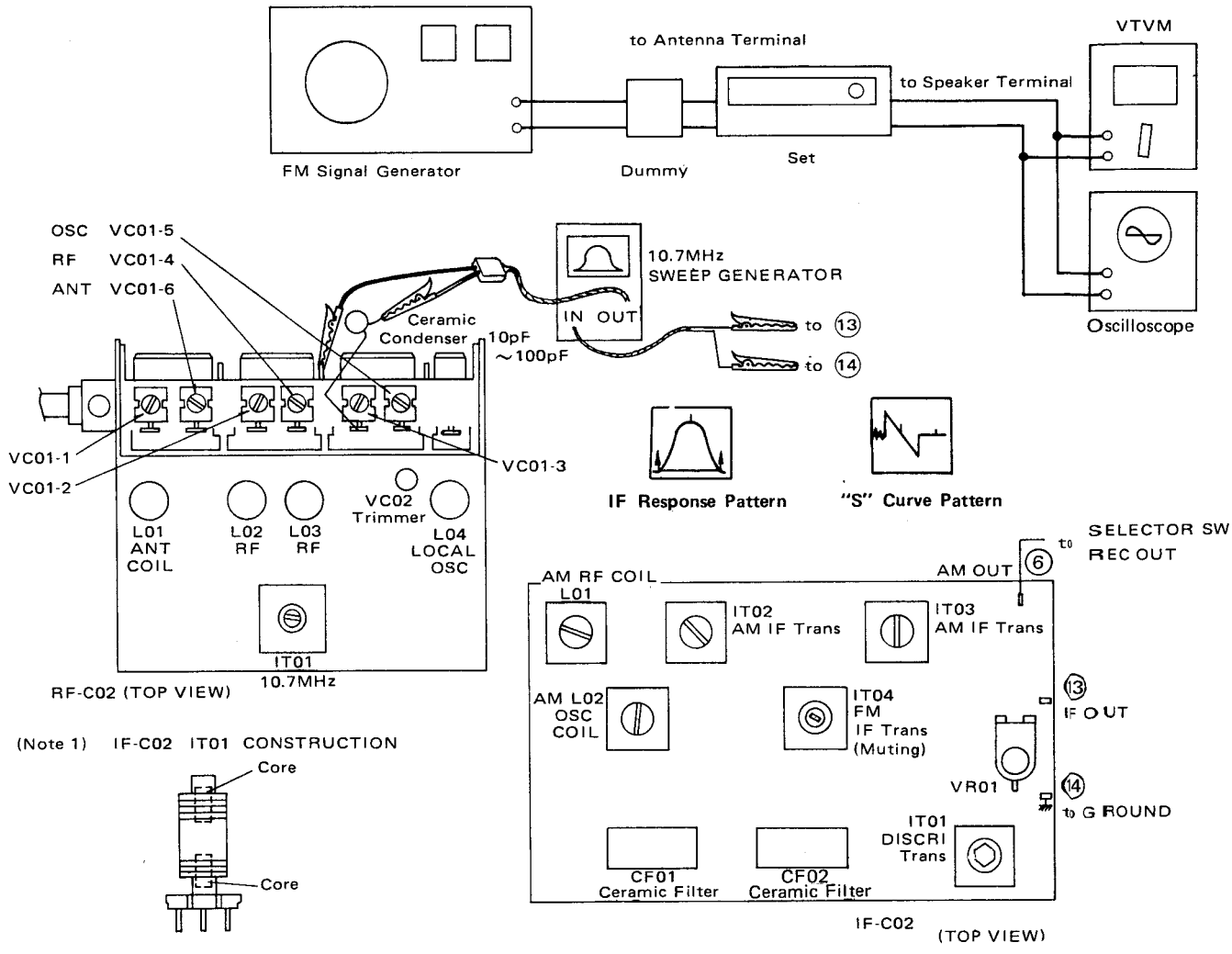
	GENERATOR CONNECTION	GENERATOR FREQUENCY	POSITION OF TUNING GANG	METERS	ADJUSTMENT	REMARKS
1	Connect loop antenna to signal generator and 24 inch away from the ferrite antenna.					
2	Loop antenna	520KHz	Tuning gang fully closed counterclockwise	Connect to Speaker terminals with load.	IF-C02 L02 (OSC)	Adjust for max deflection on VTVM.
3	same	1650KHz	Tuning gang fully open clockwise	same	RF-C03 FC01-5 (Trimmer)	same
4	Repeat steps 3 and 4 until no further improvement is noticed.					
5	Loop antenna	1400KHz	1400KHz	Connect to Speaker terminals with load.	RF-C03 VC01-4, VC01-6 (Trimmer)	Adjust for max deflection on VTVM.
6	same	600KHz	600KHz	same	Slide and adjust L001 coil on bar antenna for max.	IF-C02 L01 (RF) L001 (Ferrite Antenna)
7	Repeat steps 5 and 6 until no further improvement is attained.					

FM TUNER SECTION

Equipment:

1. SG (Signal Generator)
2. SG (Sweep Marker Generator)
3. Dummy Antenna
4. Load (dummy load 8ohm or speaker 8ohm)
5. VTVM (AC)
6. Adjusting driver
7. Oscilloscope

FM ADJUSTMENT SETUP



(Note 2) CF Marking

red	10.70MHz	black	10.64MHz
blue	10.67MHz	white	10.76MHz
orange	10.73MHz		

Figure 6

FM IF ADJUSTMENT PROCEDURE (See Fig. 6)

	STEP	ADJUSTMENT	REMARKS
1	IF Response	RF-C03 IT01, IF-C02 IT01 (lower) IF Transformers	Adjust for scope pattern with specified marker (10.7MHz) as illustrated in Fig. 6. Note 1. Keep the upper core of IF C02 IT01 in the top position. Note 2. Set the semi-fixed volume of IF C02 VR01 to the mid-position.
2	"S" Curve	IF-C02 IT01 (upper) Detector Trans	Adjust for symmetrical "S" curve as illustrated in Fig. 6.
3	Center Potential	IF-C02 VR01	Adjust for zero potential at TP-2.

FM RF ADJUSTMENT PROCEDURE (See Fig. 6)

STEP	GENERATOR FREQUENCY	POSITION OF TUNING GANG	ADJUSTMENT	REMARKS
1	87.5MHz	Tuning gang fully closed counter-clockwise	L04 (Local Osc.)	Adjust for maximum deflection on VTVM
2	108.5MHz	Tuning gang fully open clockwise	VC02 (Trimmer)	as Step 1
3	88MHz	88MHz	L01 (Ant Coil) L02 (RF Coil) L03 (RF Coil)	as Step 1
4	108MHz	108MHz	VC01-1 VC01-2 VC01-3	as Step 1
5	Repeat steps 3 and 4 until no further improvement is attained.			

Note:
The Receiver Frequency Range should not be below 87.5 MHz owing to the FTZ regulation.

If the above condition were not satisfied, adjust the Local Oscillator Coil L04 at the FM front end by turning it in the counterclockwise direction.

FM STEREO MULTIPLEX SECTION

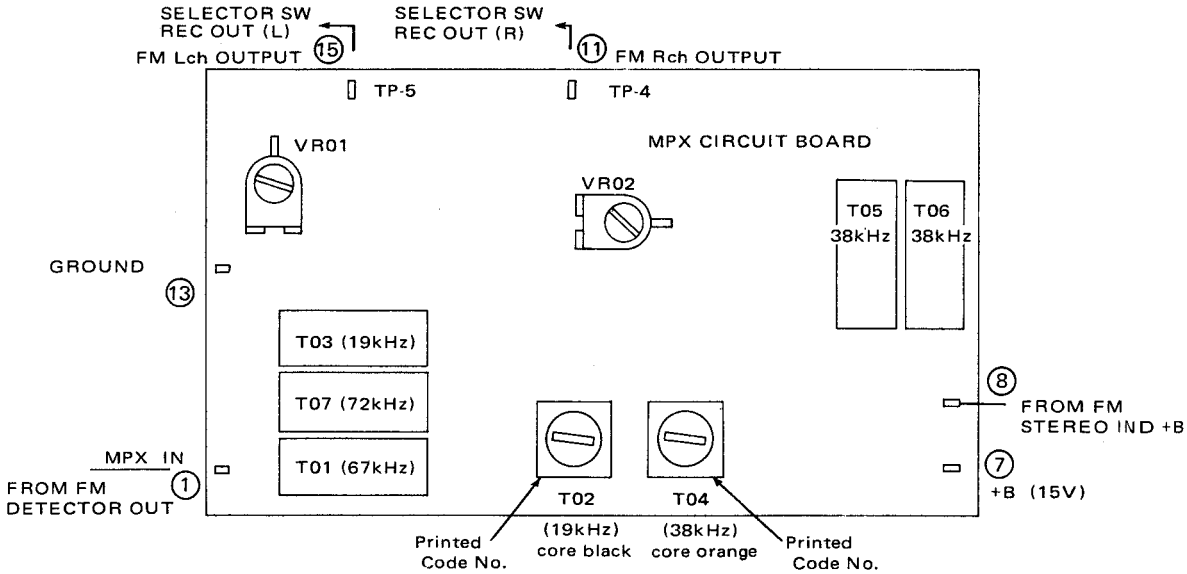
Equipment:

1. FM Signal Generator
2. FM Stereo Modulator
3. VTVM (AC)
4. Oscilloscope

FM STEREO MULTIPLEX ADJUSTMENT PROCEDURE (See Fig. 7)

	ITEM	STEP	GENERATOR	REMARKS
1	19KHz Trap 67KHz, 72KHz SCA Rejection 38KHz Trap			None Adjust 19KHz T03 67KHz T01, 72KHz T07 38KHz T05, T06.
		1	For adjustment set-up, see Fig. 7.	
2	19KHz, 38KHz AMP	2	Connect VTVM to TP-4 (or TP-5) or REC OUT.	
		3	FMSG 98MHz INPUT 60dB 19KHz 10% modulation sub channel 45% modulation	Adjust T02 (19KHz Transformer) to T04 (38KHz Transformer). obtain maximum VTVM deflection.
3	Separation Control	1	For adjustment set-up, see Fig. 7.	
		2	Connect VTVM to TP-4 (Rch) or REC OUT (R).	
		3	FM SG 98MHz INPUT 60dB 19KHz 10% modulation (L+R) + 19KHz 30% modulation L=R=400Hz or 1KHz	
		4	Set right channel to zero.	Adjust T04 (38KHz Transformer) a little to obtain minimum VTVM deflection. Adjust VR02 to obtain good separation
		5	Connect VTVM to TP-5 or REC OUT (L).	
		6	Same as step 3	
		7	Set left channel to zero.	Same as step 4.
		8	Repeat steps 4 and 7.	

Note: Preset the semi-fixed resistor VR02 to the midposition.



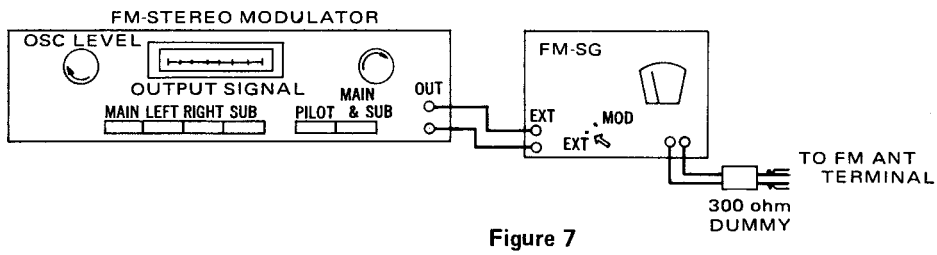


Figure 7

DIAL STRINGING DIAGRAM

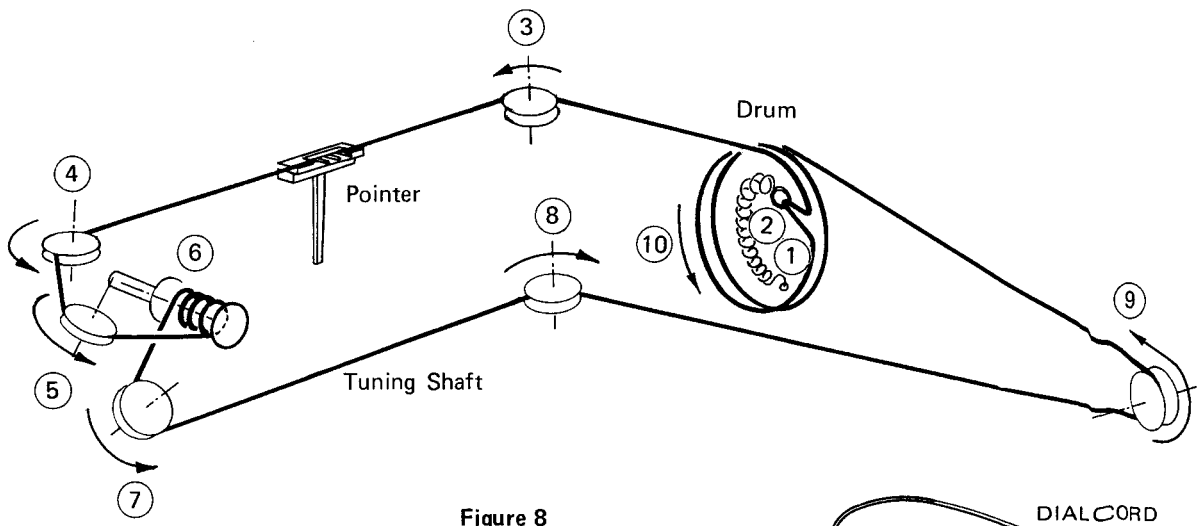
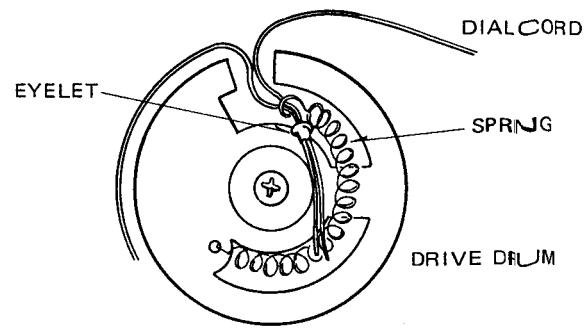


Figure 8



Dial Stringing Block Diagram

Load the dial cord as shown in the figure above. Get the cord through the eyelet as shown right.
Give tension on the dial cord by tension-spring action. Then squash the eyelet and fix it by the aid of a small amount of cement not to loosen the cord.

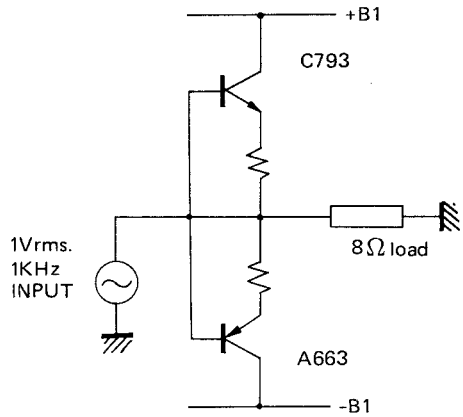
TROUBLE SHOOTING HINTS

How to examine the output power transistors:

Step 1. Remove the driver unit (AF-C04) from the connector. Also TR13 and TR14 (2SC496) are to be removed.

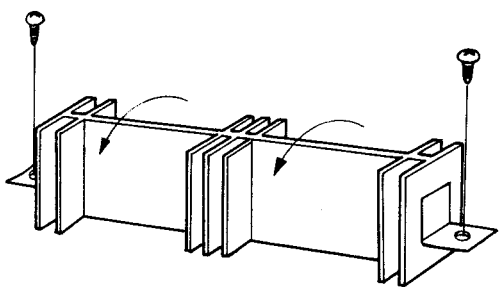
Step 2. Measure the voltage at the speaker output terminal or terminals 13 & 14 using a tester, with the power switch on.
OV (± 0.3V) indication is normal.

Step 3. Waveforms observation. Normal waveform illustrated below.

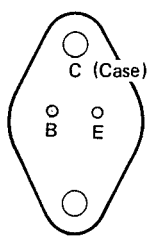


Replacement of defective power transistors:

Step 1. Remove the self-tap screws on both sides of the transistor and incline it forward as illustrated below.



Step 2. Remove the mounting screws securing the collector of the power transistor and pull out the transistor. (This is easily replaceable because TR socket is in use.)



How to examine the drive unit:

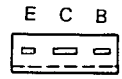
Note: If it is likely to break the power transistors during examination, disconnect the leads to the bases of 2SC793 and 2SA663.

Can one get correct mid-voltage?

Step 1. If OK ..... Does the voltage between the collector and the emitter of TR13 or TR14 (2SC496) change with variation of VR03 or VR04 (500 ohm)? (1.9V-3.5V)

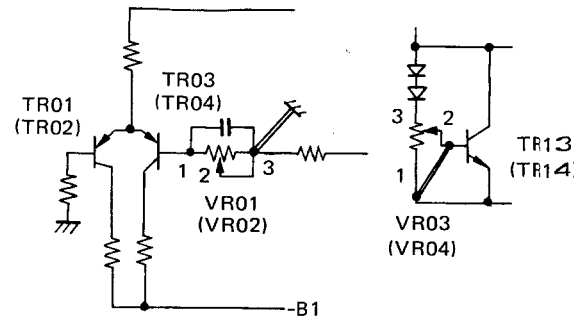
Step 2. OK ..... Normal
Adjust IC idle by VR03, VR04 with power transistors connected.
NO ..... 2SC496 is defective.

Step 3. If NOT .... If perfect adjustment to zero voltage is not possible (normally this is variable to both + and −, but in this case it is impossible), this is due to the rank difference between h_{FE}s of TR01/03 or TR02/04. Adjust the rank.



Check if the correct mid-voltage is obtainable or not.

Step 4. Examine TR, removing TR09 and TR11 (TR10 and TR12).
(Note) In many cases one meets troubles with TR09 and TR11.

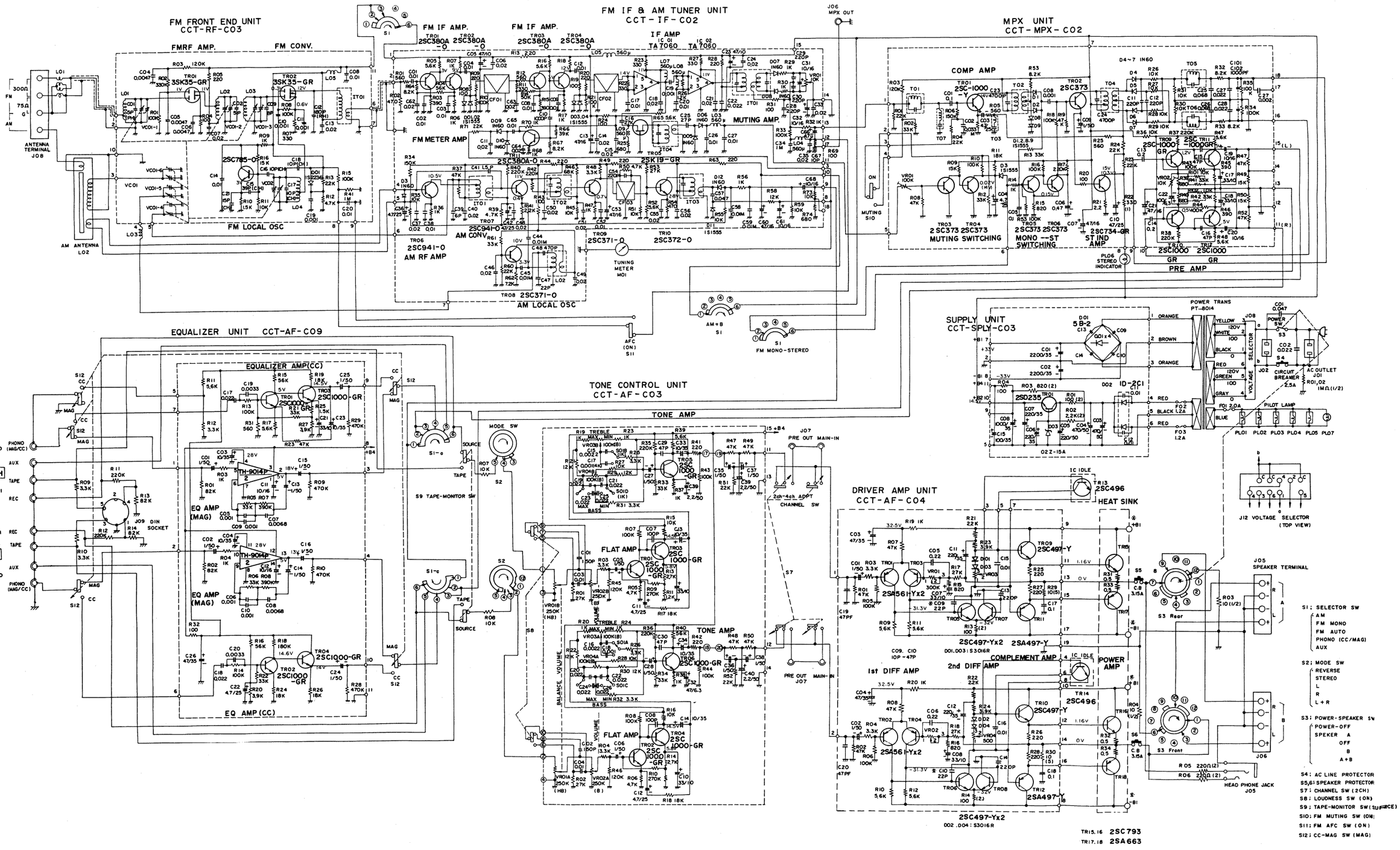


Step 5. As shown above, connect the terminal 3 of VR01 to the ground, where TR09 and TR11 are kept removed and VR01 fully turned to the terminal 3 side. Short-circuit the base with emitter.

Examine if collector voltage of TR05 (TR06) is adjustable to zero voltage with the power switch on.

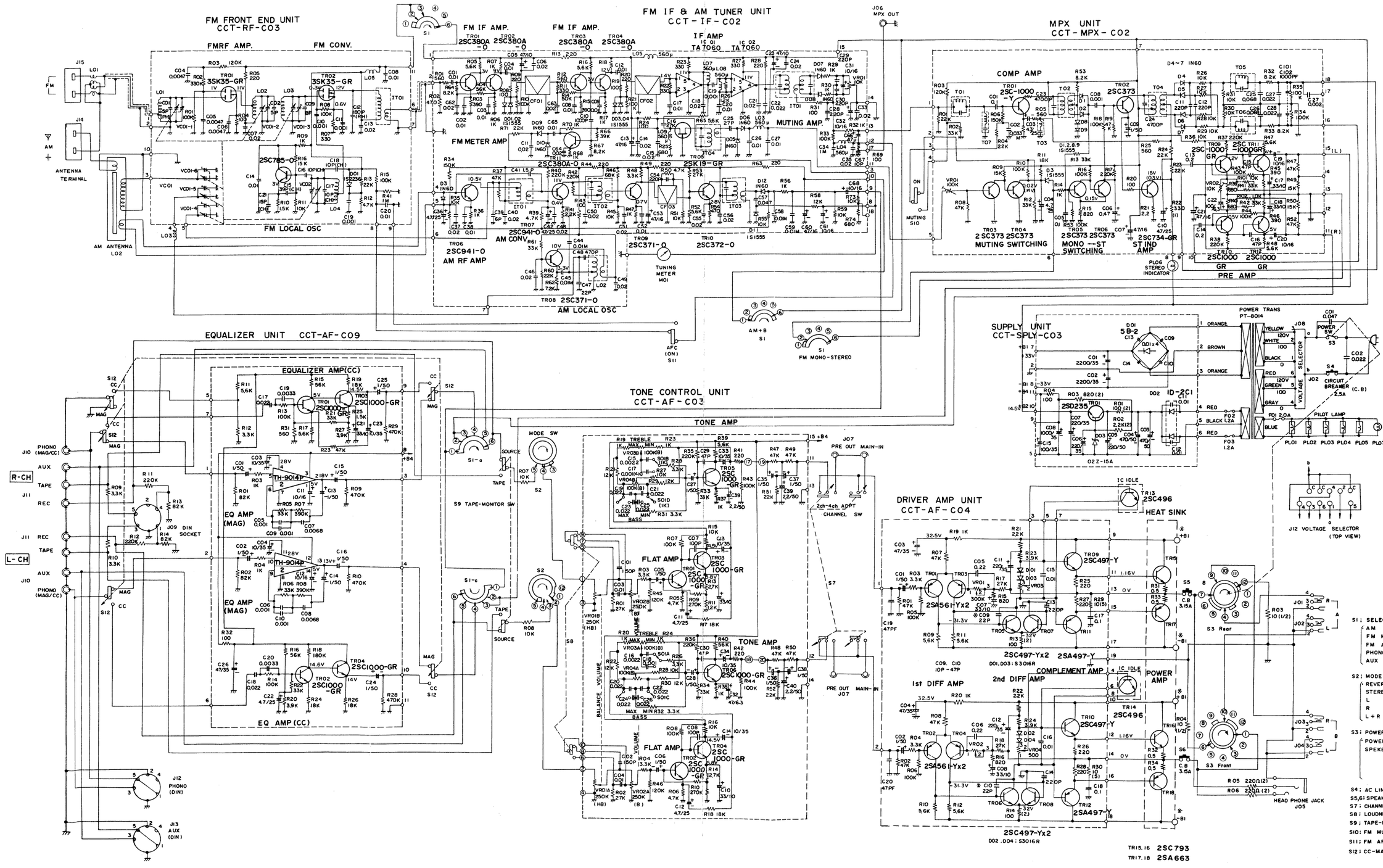
If OK ..... Examine if the voltage between collector and emitter of TR13 changes with variation of the semi-fixed VR03 (VR04) when the short-circuit between the base and the emitter of TR13 is released. (Step 1.)

If NOT ..... Check the transistors, TR01, TR03, TR05 and TR06.



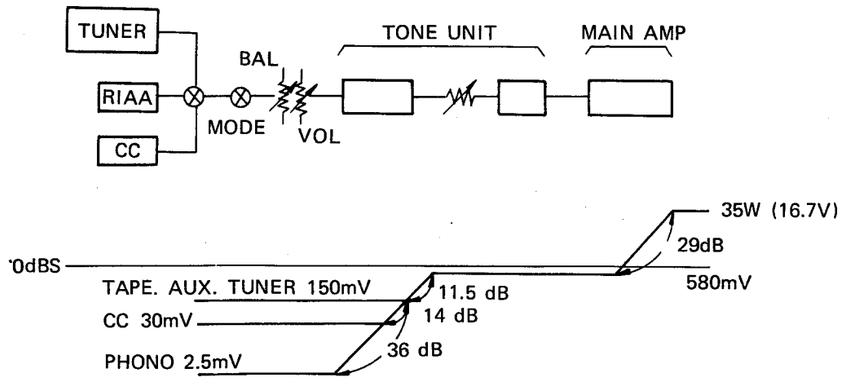
SCHEMATIC DIAGRAM-A

Toshiba **SA-500**



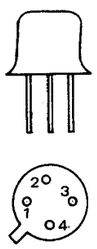
SCHEMATIC DIAGRAM - B

LEVEL DIAGRAM



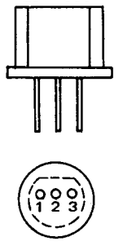
TRANSISTOR BASE DIAGRAMS

3SK35



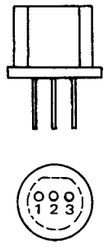
1. Drain
2. Gate 2
3. Gate 1
4. Source (Case)

2SA561
2SC373
2SC734
2SC785
2SC380A
2SC371
2SC372
2SC1000



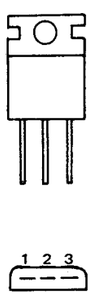
1. Emitter
2. Collector
3. Base

2SK19



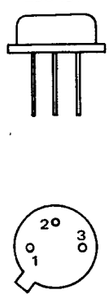
1. Drain
2. Source
3. Gate

2SD235



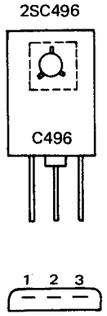
1. Base
2. Collector (Radiation Board)
3. Emitter

2SA497
2SC497



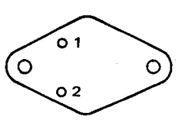
1. Emitter
2. Base
3. Collector (Case)

2SC496



1. Emitter
2. Collector
3. Base

2SA663
2SC793

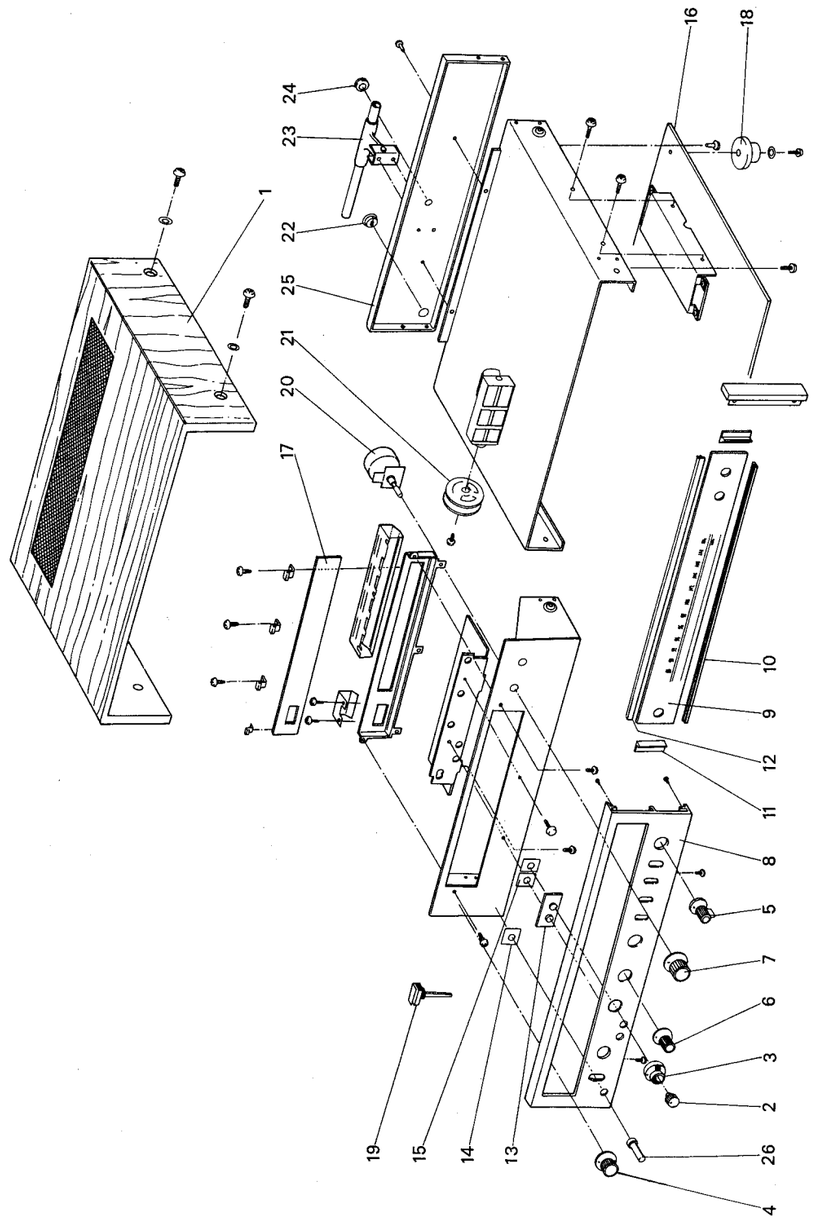


1. Emitter
2. Base
3. Case Collector

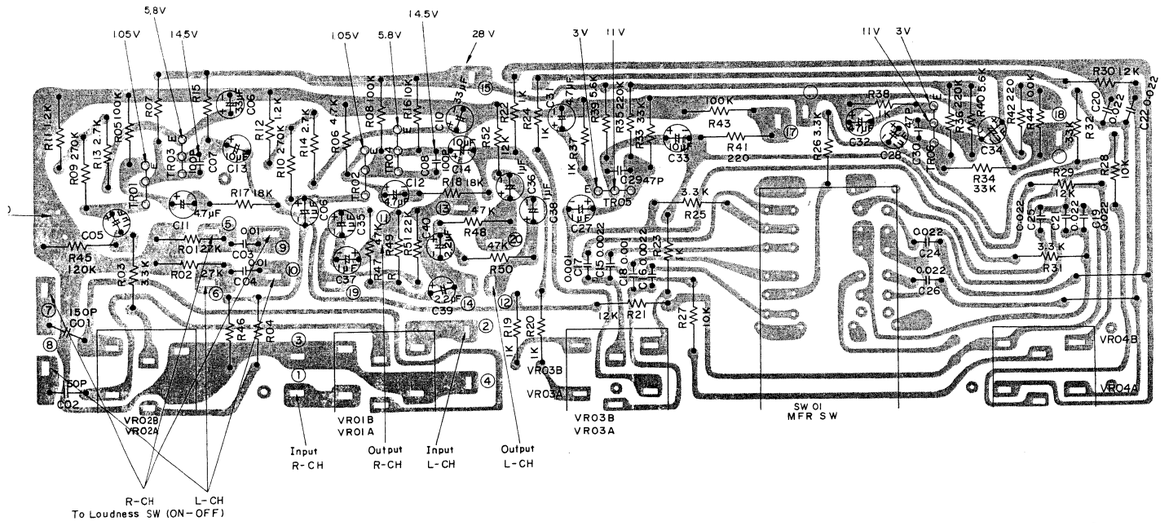
CABINET PARTS LIST

Key No.	Code No.	Description
1	22851072	Wood Cabinet Case
2	22826072	Knob, Bass, Treble (2 Used)
3	22826071	Knob, Bass, Treble (2 Used)
4	22826070	Knob, Power, Select (2 Used)
5	22826069	Knob, Mode
6	22824135	Knob, Volume, Balance (2 Used)
7	22824134	Knob, Tuning
		Panel Assembly
8	22843414	Panel with Side Panel
9	22837181	Dial Cover
10	22833207	Decoration Frame
11	22833204	Decoration Frame, Side (2 Used)
12	22756335	Cushion
13	20021180	Button Holder
14	22756328	Mask Spacer, Lever Switch (5 Used)
15	22756346	Mask Spacer, Push Switch (2 Used)
16	22842100	Back Cover
17	22836264	Dial Plate, Scale
18	22828031	Leg (4 Used)
19	22749091	Pointer Assembly
20	22749090	Tuning Shaft Assembly
21	22742071	Drum
23	22757025	Antenna Assembly (not involved Ferrite Ant.)
24	22751075	Bush
26	22845193	Knob, Lever Switch (5 Used)
		A (TA, TC, VL)
22	25845120	Cord Bushing SR-3P-4
25	22711217	Jack Plate
		B (DTE)
22	22751075	Bush
25	22711230	Jack Plate

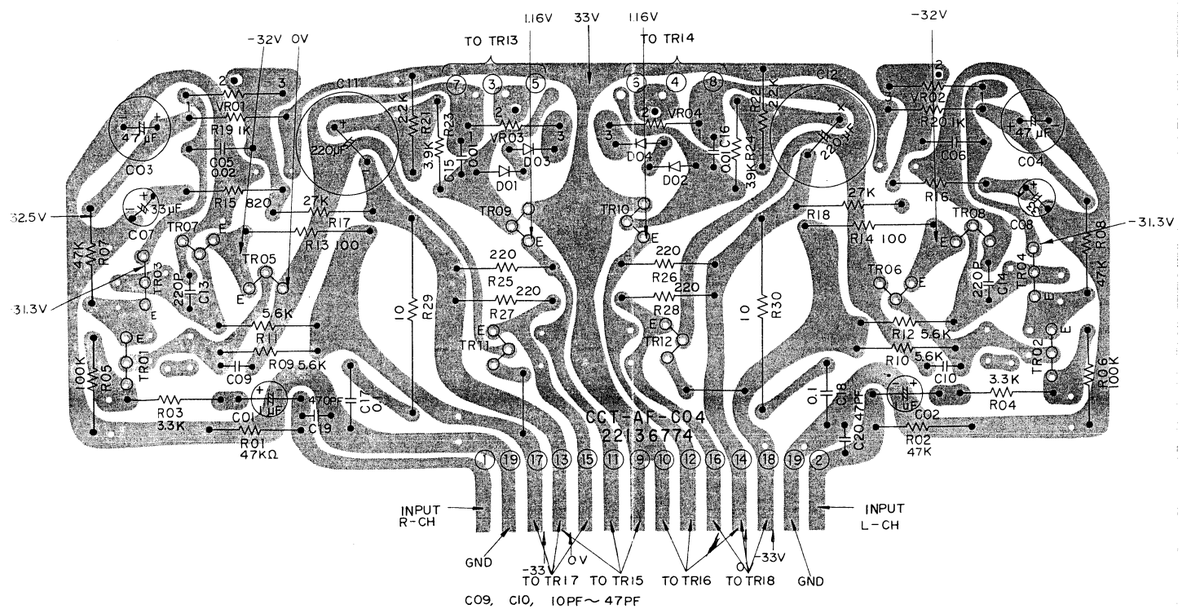
CABINET EXPRODED VIEW



PRINTED CIRCUIT DIAGRAMS AND PARTS LISTS



Bottom View of Tone Control Unit (CCT-AF-C03)



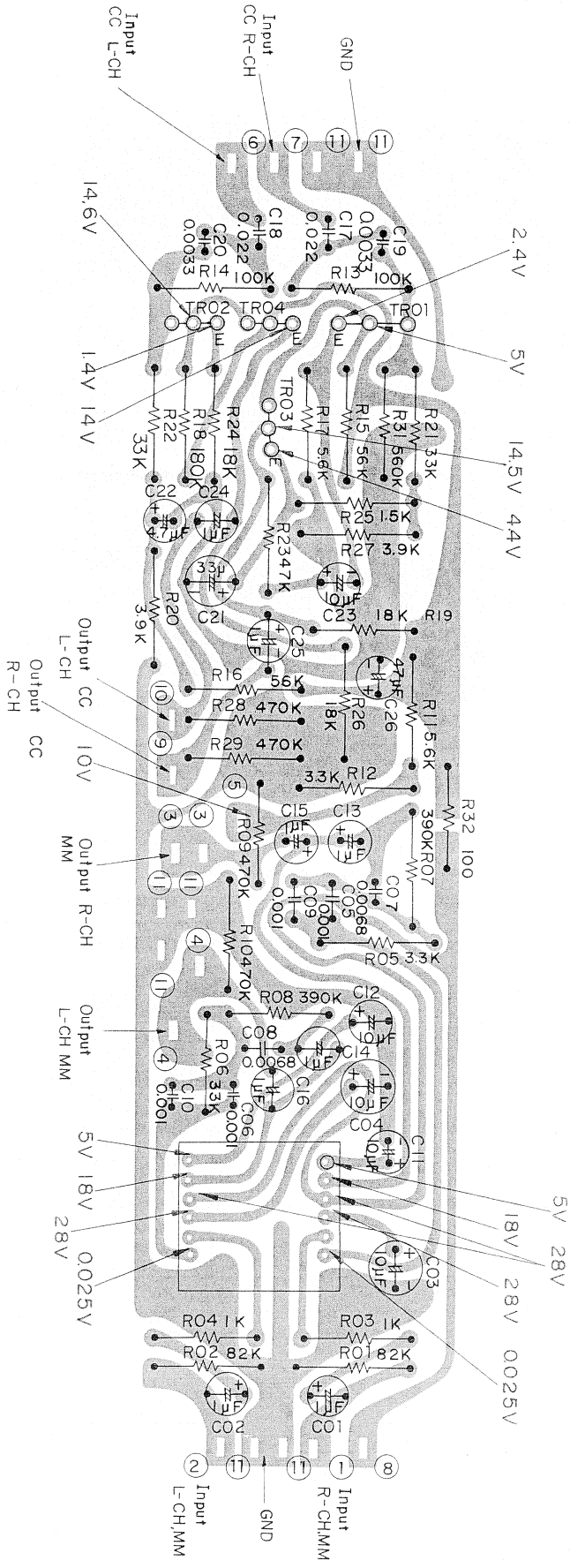
Bottom View of Driver Unit (CCT-AF-C04)

CCT-AF-C04

SYMBOL	CORD NO.	DESCRIPTION
R01,02	22544474	47 Kohm,± 10% 1/8W RD
R03,04	22544332	3 3 Kohm,± 10% 1/8W RD
R05,06	22544104	100 Kohm,± 10% 1/8W RD
R07,08	22544473	47 Kohm,± 10% 1/8W RD
R09,10	22544562	5.6 Kohm,± 10% 1/8W RD
R11,12	22544562	5.6 Kohm,± 10% 1/8W RD
R13,14	22570021	100 ohm, ±10% 2W RN
R15,16	22544821	820 ohm,± 10% 1/8W RD
R17,18	22544273	27 Kohm,± 10% 1/8W RD
R19,20	22544102	1 Kohm,± 10% 1/8W RD
R21,22	22544222	2.2 Kohm,± 10% 1/8W RD
R23,24	22544392	3.9 Kohm,± 10% 1/8W RD
R25,26	22544221	220 ohm,± 10% 1/8W RD
R27,28	22544221	220 ohm,± 10% 1/8W RD
R29,30	22500047	10 ohm, ±10% 5W RW
VR01,02	22658188	300 Kohm, Semi fixed
VR03,04	22658189	500 ohm, Semi fixed
C01,02	22448109	1μF/50 WV CE
C03,04	22447470	47μF/35 WV CE
C05,06	22373224	0.22μF 50V ±20% MY
C07,08	22443330	33μF/10 WV
C09,10	22362220	22pF 50V ±10% CC(SL)
C11,12	22447221	220μF/35 WV CE
C13,14	22362221	220pF 50 V±10% CC(SL)
C15,16	22373103	0.01μF 50 V ±20% MY
C17,18	22373104	0.1μF 50 V ±20% MY
C19,20	22362470	47pF 50 V ±10% CC(SL)
TR01,02		2SA561-Y
TR03,04		2SA561-Y
TR05,06		2SC497-Y
TR07,08		2SC497-Y
TR09,10		2SC497-Y
TR11,12		2SA497-Y
TR13,14		2SC496
D01,02		S3016-R
D03,04		S3016-R

CCT-AF-C03

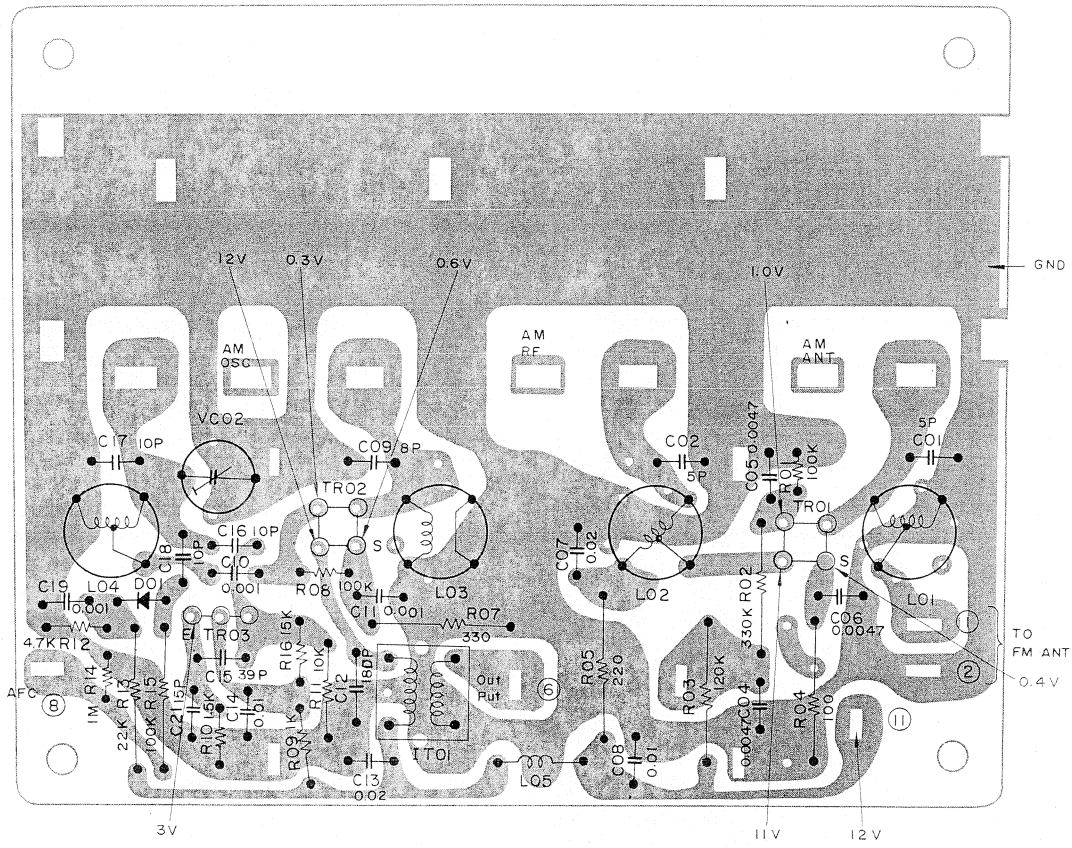
SYMBOL	CORD NO.	DESCRIPTION
R01,02	22544273	27 Kohm,± 10% 1/8W RD
R03,04	22544332	3.3 Kohm,± 10% 1/8W RD
R05,06	22544472	4.7 Kohm,± 10% 1/8W RD
R07,08	22544104	100 Kohm,± 10% 1/8W RD
R09,10	22544274	270 Kohm,± 10% 1/8W RD
R11,12	22544122	1.2 Kohm,± 10% 1/8W RD
R13,14	22544272	2.7 Kohm,± 10% 1/8W RD
R15,16	22544103	10 Kohm,± 10% 1/8W RD
R17,18	22544183	18 Kohm,± 10% 1/8W RD
R19,20	22544102	1 Kohm,± 10% 1/8W RD
R21,22	22544123	12 Kohm,± 10% 1/8W RD
R23,24	22544102	1 Kohm,± 10% 1/8W RD
R25,26	22544332	3.3 Kohm,± 10% 1/8W RD
R27,28	22544103	10 Kohm,± 10% 1/8W RD
R29,30	22544123	12 Kohm,± 10% 1/8W RD
R31,32	22544332	3.3 Kohm
R33,34	22544333	33 Kohm
R35,36	22544224	220 Kohm
R37,38	22544102	1 Kohm
R39,40	22544562	5.6 Kohm
R41,42	22544221	220 ohm
R43,44	22544104	100 Kohm
R45,46	22544124	120 Kohm
R47,48	22544473	47 Kohm
R49,50	22544473	47 Kohm
R51,52	22544223	22 Kohm
VR01	22651405	250 Kohm (MN) BALANCE
VR02	22650407	250 Kohm (B) VOLUME
VR03	22655403	100 Kohm (B) TREBLE
VR04	22655540	100 Kohm (B) BASS
C01,02	22362151	150 pF 50 V ±10% CC(SL)
C03,04	22373103	0.01μF 50 V ±20% MY
C05,06	22448109	1μF 50 WV CE
C07,08	22362101	100pF 50 V ±10% CC(SL)
C09,10	22443330	33μF 10 WV CE
C11,12	22446479	4.7μF 35 WV CE
C13,14	22447100	10μF 35 WV CE
C15,16	22373222	0.0022μF 50 V ±20% MY
C17,18	22373102	0.001μF 50 V ±20% MY
C19,20	22373223	0.022μF 50 V±20% MY
C21,22	22373223	0.022μF 50V±20% MY
C23,24	22373223	0.022μF 50V ±20% MY
C25,26	22373223	0.022μF 50V ±20% MY
C27,28	22448109	1μF 50 WV CE
C29,30	22362470	47 pF 50 V ±10% CC(SL)
C31,32	22442470	47μF 6.3 WV CE
C33,34	22447100	10μF 35 WV CE
C35,36	22448109	1μF 50 WV CE
C37,38	22448109	1μF 50 WV CE
C39,40	22448229	2.2μF 50 WV CE
TR01,02		2SC1000-GR
TR03,04		2SC1000-GR
TR05,06		2SC1000-GR
SW01	22146273	Multi Frequency Responser



Bottom View of Equalizer Unit (CCT-AF-C09)

CCT-AF-C09

SYMBOL	CORD NO.	DESCRIPTION
R01,02	22544823	82 Kohm,±10% 1/8W RD
R03,04	22544102	1 Kohm,±10% 1/8W RD
R05,06	22544333	33 Kohm,±10% 1/8W RD
R07,08	22544394	390 Kohm,±10% 1/8W RD
R09,10	22544474	470 Kohm,±10% 1/8W RD
R11	22544562	5.6 Kohm, ±10% 1/8W RD
R12	22544332	3.3 Kohm,±10% 1/8W RD
R13,14	22544104	100 Kohm,±10% 1/8W RD
R15	22544563	56 Kohm,±10% 1/8W RD
T16	22544563	56 Kohm,±10% 1/8W RD
R17	22544562	5.6 Kohm,±10% 1/8W RD
R18	22544184	180 Kohm, ±10% 1/8W RD
R19	22544183	18 Kohm,±10% 1/8W RD
R20	22544392	3.9 Kohm,±10% 1/8W RD
R21	22544333	33 Kohm, ±10% 1/8W RD
R22	22544333	33 Kohm,±10% 1/8W RD
R23	22544473	47 Kohm, ±10% 1/8W RD
R24	22544183	18 Kohm,±10% 1/8W RD
R25	22544152	1.5 Kohm,±10% 1/8W RD
R26	22544183	18 Kohm,±10% 1/8W RD
R27	22544392	3.9 Kohm,±10% 1/8W RD
R28	22544474	470 Kohm± 10% 1/8W RD
R29	22544474	470 Kohm,±10% 1/8W RD
R30		—
R31	22544564	560 Kohm,±10% 1/8W RD
R32	22544101	100 ohm, ±10% 1/8W RD
C01,02	22448109	1μF 50 WV CE
C03,04	22447100	10μF 35 WV CE
C05,06	22373102	0.001μF 50 V±20% MY
C07,08	22373682	0.0068μ 50 V ±20% MY
C09,10	22373102	0.001μF 50 V±20 % MY
C11,12	22445100	10μF 16 WV CE
C13,14	22448109	1μF 50 WV CE
C15,16	22448109	1μF 50 WV CE
C17,18	22373223	0.022μF 50 V ±20% MY
C19,20	22373332	0.0033μF 50 V±20% MY
C21	22443330	33μF 10 WV CE
C22	22446479	4.7μF 25 WV CE
C23	22447100	10μF 35 WV CE
C24	22448109	1μF 50 WV CE
C25	22448109	1μF 50 WV CE
C26	22447470	47μF 35WV CE
IC01		TH9014P
TR01,02		2SC1000-GR
TR03,04		2SC1000-GR

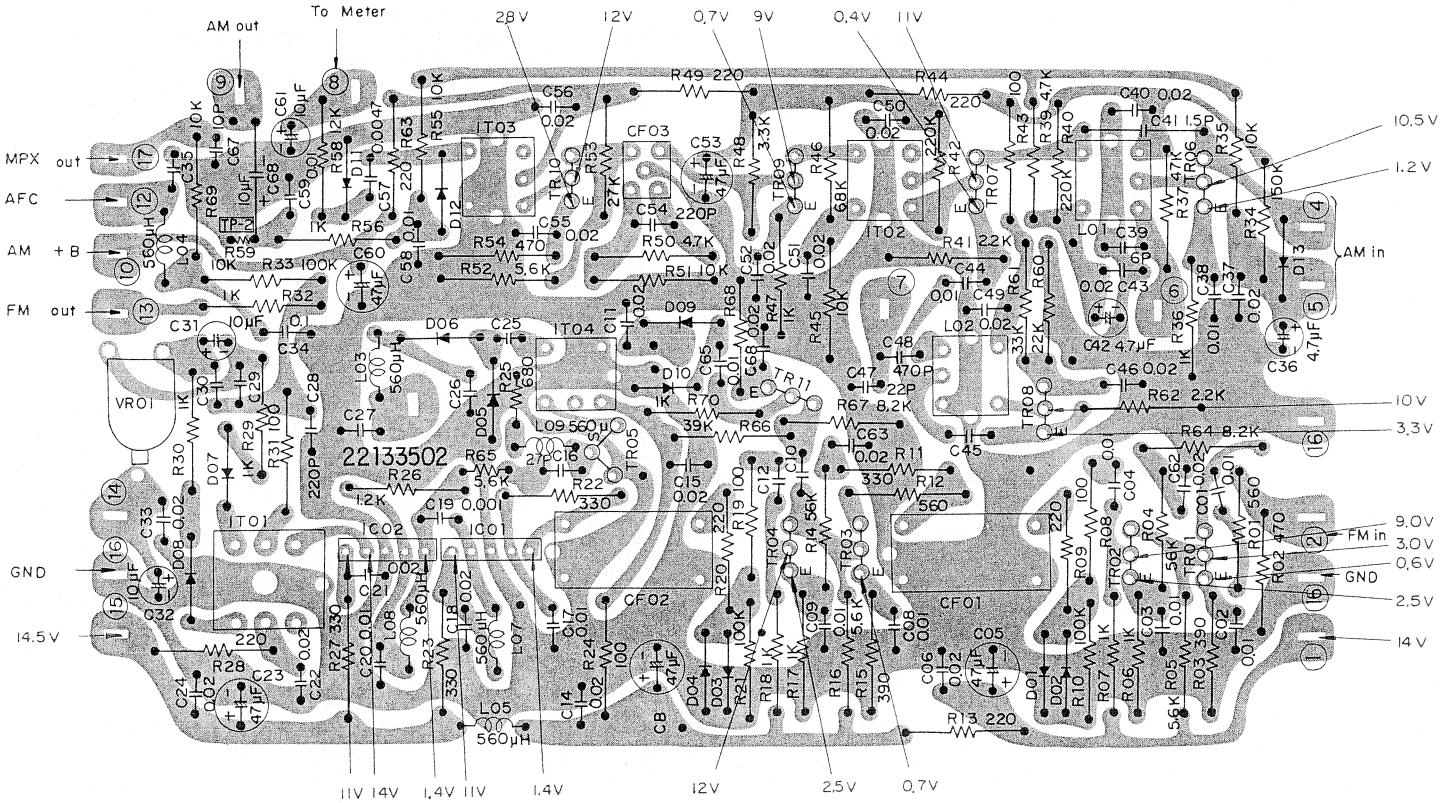


Bottom View of FM Front End (CCT-RF-C03)

CCT-RF-C03

SYMBOL	CORD NO.	DESCRIPTION
R01	22554104	100 Kohm, ±10% 1/4W RD
R02	22544334	330 Kohm, ±10% 1/4W RD
R03	22544124	120 Kohm, ±10% 1/4W RD
R04	22544101	100 ohm, ±10% 1/4W RD
R05	22544221	220 ohm, ±10% 1/4W RD
R06	—	—
R07	22544331	330 ohm, ±10% 1/4W RD
R08	22554104	100 Kohm, ±10% 1/4W RD
R09	22554102	1 Kohm, ±10% 1/4W RD
R10	22554152	1.5 Kohm, ±10% 1/4W RD
R11	22544103	10 Kohm, ±10% 1/4W RD
R12	22554472	4.7 Kohm, ±10% 1/4W RD
R13	22544223	22 Kohm, ±10% 1/4W RD
R14	22554105	1 Mohm, ±10% 1/4W RD
R15	22544104	100 Kohm, ±10% 1/4W RD
R16	22554153	15 Kohm, ±10% 1/4W RD
C01	22361509	5pF 50V±0.5pF CC(SL)
C02	22361509	5pF 50V±0.5pF CC(SL)
C03		—
C04	22341472	0.0047μF
C05	22341472	0.0047μF 50V +80%, -20%
C06	22341472	0.0047μF CK
C07	22341203	0.02μF 50 V+80%,-20% CK
C08	22341103	0.01μF 50 V+80%,-20% CK
C09	22361809	5pF 50 V ±0.5pF CC(SL)

SYMBOL	CORD NO.	DESCRIPTION
C10	22341102	0.001μF 50 V+80%,-20% CK
C11	22341102	0.001μF 50 V CK
C12	22360242	180pF 50 V ±10% CC(RH)
C13	22341203	0.02μF 50 V+80%, -20% CK
C14	22341103	0.01μF 50 V+80%,-20% CK
C15	22360137	39pF 50 V ±5% CC(CH)
C16	22360131	10pF 50 V ±5% CC(CH)
C17	22360138	10pF 50 V ±5% CC(PH)
C18	22360131	10pF 50 V ±5% CC(CH)
C19	22341102	0.001μF 50 V+80%,-20% CK
C20	22341103	0.01μF 50 V+80%, -20% CK
C21	22360132	15pF 50 V ±5% CC (CH)
VC01	22307352	Variable Capacitor
VC02	22309108	Trimmer Condenser
TR01		3SK35-GR
TR02		3SK35-GR
TR03		2SC785-O
D01		1S2236
L01	22292019	ANT Coil
L02	22292020	RF Coil
L03	22294217	RF Coil
L04	22295016	Local Osc Coil
L05	22241009	Choke Coil
IT01	22265655	FM IFT



Bottom View of FM, IF & AM Tuner Unit (CCT-IF-C02)

CCT-IF-C02

SYMBOL	CORD NO.	DESCRIPTION
R01	22544561	560 ohm, ±10% 1/8W RD
R02	22544471	470 ohm, ±10% 1/8W RD
R03	22544391	390 ohm, ±10% 1/8W RD
R04	22544563	56 Kohm, ±10% 1/8W RD
R05	22544562	5.6 Kohm, ±10% 1/8W RD
R06	22544102	1 Kohm, ±10% 1/8W RD
R07	22544102	1 Kohm, ±10% 1/8W RD
R08	22544101	100 ohm, ±10% 1/8W RD
R09	22544221	220 ohm, ±10% 1/8W RD
R10	22544104	100 Kohm, ±10% 1/8W RD
R11	22544331	330 ohm, ±10% 1/8W RD
R12	22544561	560 ohm, ±10% 1/8W RD
R13	22544221	220 ohm, ±10% 1/8W RD
R14	22544563	56 Kohm, ±10% 1/8W RD
R15	22544391	390 ohm, ±10% 1/8W RD
R16	22544562	5.6 Kohm, ±10% 1/8W RD
R17	22544102	1 Kohm, ±10% 1/8W RD
R18	22544102	1 Kohm, ±10% 1/8W RD
R19	22544101	100 ohm, ±10% 1/8W RD
R20	22544220	220 ohm, ±10% 1/8W RD
R21	22544101	100 Kohm, ±10% 1/8W RD
R22	22544331	330 ohm, ±10% 1/8W RD
R23	22544331	330 ohm, ±10% 1/8W RD
R24	22544101	100 ohm, ±10% 1/8W RD
R25	22544881	680 ohm, ±10% 1/8W RD
R26	22544122	1.2 Kohm, ±10% 1/8W RD
R27	22544331	330 ohm, ±10% 1/8W RD
R28	22544221	220 ohm, ±10% 1/8W RD
R29,30	22544101	1 Kohm, ±10% 1/8W RD
R31	22544101	100 ohm, ±10% 1/8W RD
R32	22544102	1 Kohm, ±10% 1/8W RD
R33	22544104	100 Kohm, ±10% 1/8W RD
R34	22544154	150 Kohm, ±10% 1/8W RD
R35	22544103	10 Kohm, ±10% 1/8W RD

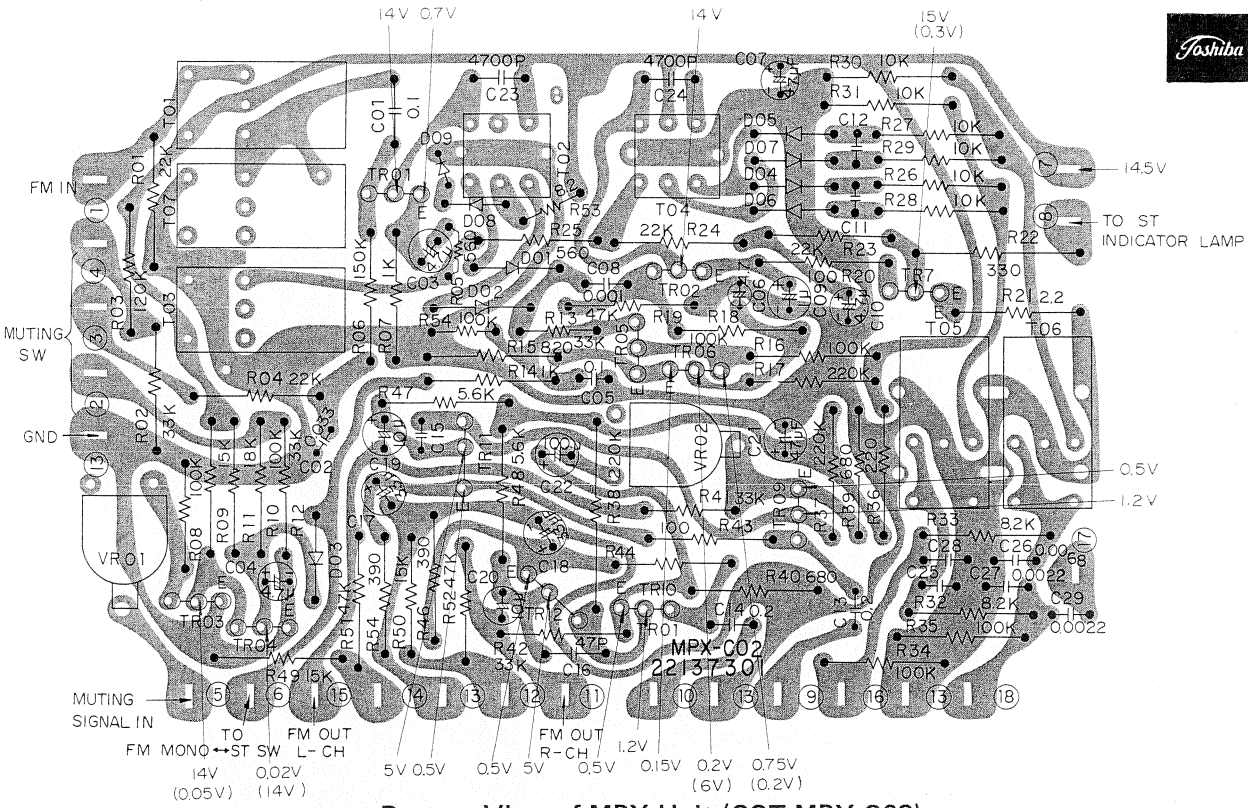
SYMBOL	CORD NO.	DESCRIPTION
R36	22544102	1 Kohm, ±10% 1/8W RD
R37	22544473	47 Kohm, ±10% 1/8W RD
R38	22544123	12 Kohm, ±10% 1/8W RD
R39	22544472	4.7 Kohm, ±10% 1/8W RD
R40	22544224	220 Kohm, ±10% 1/8W RD
R41	22544222	2.2 Kohm, ±10% 1/8W RD
R42	22544224	220 Kohm, ±10% 1/8W RD
R43	22544101	100 ohm, ±10% 1/8W RD
R44	22544221	220 ohm, ±10% 1/8W RD
R45	22544103	10 Kohm, ±10% 1/8W RD
R46	22544683	68 Kohm, ±10% 1/8W RD
R47	22544102	1 Kohm, ±10% 1/8W RD
R48	22544332	3.3 Kohm, ±10% 1/8W RD
R49	22544221	220 ohm, ±10% 1/8W RD
R50	22544472	4.7 Kohm, ±10% 1/8W RD
R51	22544103	10 Kohm, ±10% 1/8W RD
R52	22544562	5.6 Kohm, ±10% 1/8W RD
R53	22544273	27 Kohm, ±10% 1/8W RD
R54	22544474	470 ohm, ±10% 1/8W RD
R55	22544103	10 Kohm, ±10% 1/8W RD
R56	22544102	1 Kohm, ±10% 1/8W RD
R57		—
R58	22544822	8.2 Kohm, ±10% 1/8W RD
R59	22544103	10 Kohm, ±10% 1/8W RD
R60	22544223	22 Kohm, ±10% 1/8W RD
R61	22544333	33 Kohm
R62	22544222	2.2 Kohm
R63	22544221	220 ohm
R64	22544822	8.2 Kohm
R65	22544562	5.6 Kohm
R66	22544393	39 Kohm
R67	22544822	8.2 Kohm
R68	22544102	1 Kohm
R69	22544103	10 Kohm

SYMBOL	CORD NO.	DESCRIPTION
R70	22544102	1 Kohm
R71	22544223	22 Kohm
R72	22544102	10 Kohm
VR01	22658177	10 Kohm
C01	22341103	0.01μF CK
C02	22341103	0.01μF CK
C03	22341103	0.01μF CK
C04	22341103	0.01μF CK
C05	22445470	47μF 16WV CE
C06	22341203	0.02μF CK
C07		—
C08	22341103	0.01μF CK
C09	22341103	0.01μF CK
C10	22341102	0.001μF 50V CK
C11	22341203	0.02μF 50V CK
C12	22341103	0.01μF 50V CK
C13	22445470	47μF 16WV CE
C14	22341203	0.02μF 50V CK
C15	22341203	0.02μF 50V CK
C16	22362270	27 pF 50V ±10% CC(SL)
C17	22341103	0.01μF 50V CK
C18	22341203	0.02μF 50V CK
C19	22341102	0.001μF 50V CK
C20	22341103	0.01μF 50V CK
C21	22341203	0.02μF 50V CK
C22	22341203	0.02μF 50V CK
C23	22445470	47μF 16WV CE
C24	22341203	0.02μF 50V CK
C25	22362270	27 pF 50V ±10% CC(SL)
C26	22341103	0.01μF 50V CK
C27	22341103	0.01μF 50V CK
C28	22362221	220 pF 50V ±10% CC(SL)
C29,30	22362221	220 pF 50V ± 10% CC(SL)
C31	22445100	10μF 16WV CE
C32	22445100	10μF 16WV CE
C33	22341203	0.02μF 50V CK
C34	22373104	0.1μF 50V ± 20% MY
C35	22341203	0.02μF 50V CK
C36	22446479	4.7μF 25WV CE
C37	22341203	0.02μF 50V CK
C38	22341103	0.01μF 50V CK
C39	22361609	6pF 50WV ± 0.5pF CC(SL)
C40	22341203	0.02μF 40V CK
C41	22360007	1.5pF 500V Giminic
C42	22446479	4.7μF 25WV CE
C43	22341203	0.02μF 50V CK
C44	22373103	0.01μF 50V ± 20% MY
C45	22341103	0.01μF 50V CK
C46	22341203	0.02μF 50V CK
C47	22362220	22pF 50V ±10% CC(SL)
C48	22381471	470pF 50V ± 5% PS
C49	22341203	0.02μF 50V CK
C50	22341203	0.02μF 50V CK
C51	22341203	0.02μF 50V CK
C52	22341103	0.01μF 50V CK
C53	22445470	47μF 16WV CE
C54	22362221	220pF 50V ±10% CC(SL)
C55	22341203	0.02μF 50V CK
C56	22341203	0.02μF 50V CK
C57	22341472	0.0047μF 50V CK
C58	22373103	0.01μF 50V ±20% MY
C59	22373103	0.01μF 50V ±20% MY
C60	22445470	47μF 16WV CE

SYMBOL	CORD NO.	DESCRIPTION	
C61	22445100	10μF 16W CE	
C62	22341203	0.02μF 50V CK	
C63	22341203	0.02μF 50V CK	
C64	22341203	0.02μF 50V CK	
C65	22341103	0.01μF 50V CK	
C66	22446479	4.7μF 25WV CE	
C67	22362100	10pF 50V ±10% CC(SL)	
C68	22445100	10μF 16WV CE	
TR01,02		2SC380A-O	
TR03,04		2SC380A-O	
TR05		2SK19-GR	
TR06		2SC941-O	
TR07		2SC941-O	
TR08		2SC371-O	
TR09		2SC371-O	
TR10		2SC372-O	
TR11		2SA380A-O	
IC01		TA7060P	
IC02		TA7060P	
D01,02		1S1555	
D03,04		1S1555	
D05,06		1N60	
D07,08		1N60 Pair	
D09,10		1N60	
D11		1S1555	
D12		1N60	
D13		1N60	
CF01,02	22153017	Ceramic Filter	10.7 MHz
CF03	22152009	Ceramic Filter	455 KHz
IT01	22267306	FM Discri Trans	IT8475
IT02	22264626	AM IFT	IT5477
IT03	22266308	AM IFT	IT5776
IT04	22265654	FM Muting	IT6479
L01	22244046	AM RF Coil	RT6064
L02	22245232	AM Local OSC	RT7288
L03,04	22241009	Choke Coil	LH9046
L05,06	22241009	Choke Coil	LH9046
L07,08	22241009	Choke Coil	LH9046

CCT-MPX-C02

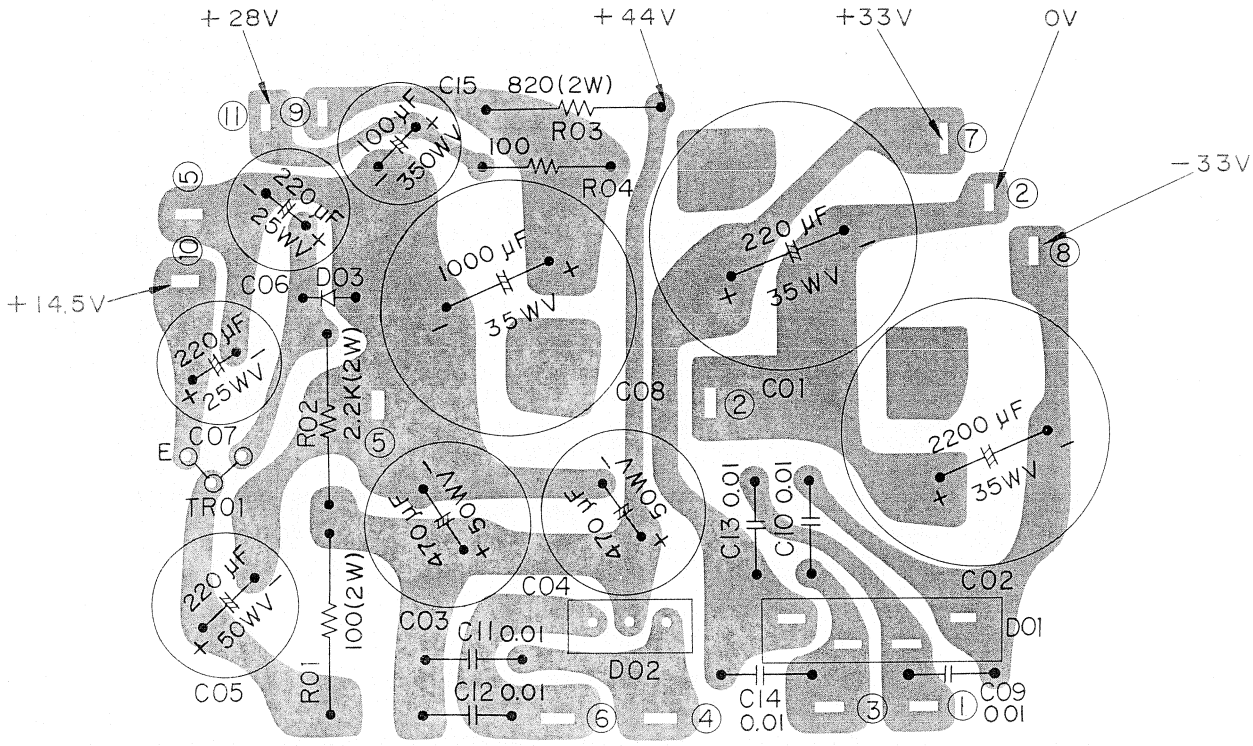
SYMBOL	CORD NO.	DESCRIPTION
R01,02	22544106	1 Mohm ± 10% 1/2W RC
R03,04	22544100	10 ohm ±10% 1/2W RC
R05,06	22544224	220 ohm ±10% 2W
R07,08	22544103	10 Kohm
R09,10	22544332	3.3 Kohm
R11,12	22544224	220 Kohm ± 10% 1/8W
R13,14	22544823	82 Kohm
R31,32	22500048	0.5 ohm ±10% 3W
R33,34	22500048	0.5 ohm Wire wound
R101,102	22544103	10 Kohm
R103	22544103	10 Kohm
C01	22310001	0.047μ F paper 600V
C02	22310012	0.022μF paper 600V
C101,102	22382102	1,000pF ± 10% PS
L01	22292019	Balumn Trans
L02	22242453	AM Ferrite Antenna FA 1618
L03	22211144	Choke Coil 1μH



Bottom View of MPX Unit (CCT-MPX-C02)

SYMBOL	CORD NO.	DESCRIPTION
R01	22554223	22 Kohm,±10% 1/8W RD
R02	22554473	47 Kohm,±10% 1/8W RD
R03	22544124	120 Kohm,±10% 1/8W RD
R04	22544223	22 Kohm,±10% 1/8W RD
R05	22554561	560 ohm,±10% 1/8W RD
R06	22554154	150 Kohm,±10% 1/8W RD
R07	22554102	1 Kohm,±10% 1/8W RD
R08	22554104	100 Kohm,±10% 1/8W RD
R09	22554153	15 Kohm,±10% 1/8W RD
R10	22544104	100 Kohm,±10% 1/8W RD
R11	22554183	18 Kohm,±10% 1/8W RD
R12	22544333	33 Kohm,±10% 1/8W RD
R13	22554333	33 Kohm,±10% 1/8W RD
R14	22554102	1 Kohm,±,10% 1/8W RD
R15	22554821	820 ohm,±10% 1/8W RD
R16	22554104	100 Kohm,±10% 1/8W RD
R17	22554224	220 Kohm,±10% 1/8W RD
R18	22554104	100 Kohm,±10% 1/8W RD
R19	22554373	47 Kohm,±10% 1/8W RD
R20	22554101	100 ohm,±10% 1/8W RD
R21	22554229	2.2 ohm,±10% 1/8W RD
R22	22572331	330 ohm,±10% 1W RS
R23	22554223	22 Kohm,±10% 1/8W RD
R24	22554223	22 Kohm,±10% 1/8W RD
R25	22554561	560 ohm,±10% 1/8W RD
R26,27	22554103	10 Kohm,±10% 1/8W RD
R28,29	22554103	10 Kohm,±10% 1/8W RD
R30,31	22554103	10 Kohm,±10% 1/8W RD
R32,33	22554822	8.2 Kohm,±10% 1/8W RD
R34,35	22554104	100 Kohm,±10% 1/8W RD
R36	22554221	220 ohm,±10% 1/8W RD
R37,38	22554224	220 Kohm, ±10% 1/8W RD
R38,40	22554681	680 ohm,±10% 1/8W RD
R41,42	22554333	33 Kohm,±,10% 1/8W RD
R43,44	22544104	100 Kohm,±10% 1/8W RD
R45,46	22544391	390 ohm,±10% 1/8W RD
R47,48	22544562	5.6 Kohm,± 10% 1/8W RD
R49,50	22544153	15 Kohm,±10% 1/8W RD
R51,52	22544473	47 Kohm,±10% 1/8W RD
R53	22544822	8.2 Kohm,±10% 1/8W RD
R54	22544104	100 Kohm, ±10% 1/8W RD
VR01	22658178	100 Kohm, FM Muting Lever
VR02	22658177	10 Kohm Separation Control

SYMBOL	CORD NO.	DESCRIPTION
C01	22340002	0.1μF 50V MY
C02	22373333	0.033μF 50V MY
C03	22446479	4.7μF 25WV CE
C04	22446479	4.7μF 25WV CE
C05	22373103	0.01μF 50V±20% MY
C06	22448478	0.47μF 50WV CE
C07	22445470	47μF 16WV CE
C08	22474102	0.001μF 50V±20% MY
C09	22448109	1μF 50WV CE
C10	22446477	4.7μF 16WV CE
C11,12	22362221	220pF 50V±10% CC(SL)
C13,14	22340001	0.2μF 12V Ceramic
C15,16	22362470	47pF 50V±10% CC(SL)
C17,18	22443330	33μF 10WV CE
C19,20	22445100	10μF 16WV CE
C21	22445470	47μF 16WV CE
C22	22442101	100μF 6.3WV CE
C23	22382472	4700pF 50V±10% PS
C24	22382472	4700pF 50V±10% PS
C25,26	22371682	0.0068μF MY 50V ±5%
C27,28	22371222	0.0022μF MY 50V±5%
C29	22371222	0.002μF MY 50V±5%
TR01		2SC1000-Y
TR02		2SC373
TR03,04		2SC373
TR05,06		2SC373
TR07		2SC734-GR
TR08		—
TR09,10		2SC1000-GR
TR11,12		2SC1000-GR
D1,2		1S1555
D3		1S1555
D4,5		1N60
D6,7		1N60
D8,9		1S1555
T01	22212026	COIL-ST3204 (67KHz)
T02	22212029	COIL-ST1111 (19KHz)
T03	22212028	COIL-ST1112 (19KHz)
T04	22212030	COIL-ST2306 (38 KHz)
T05,06	22212027	COIL-ST2307 (38 KHz)



Bottom View of Supply Unit (CCT-SUPPLY-C03)

CCT-SUPPLY-C03

SYMBOL	CORD NO.	DESCRIPTION
R01	22570021	100 ohm ±10% 2W, RS
R02	22570023	2.2 K ohm ±10% 2W RS
R03	22570026	820 ohm ±10% 1/4W RS
R04	22544101	100 ohm ±10% 1/4W RD
C01,02	22430022	2200μF 35WV
C03,04	22448471	470μF 50WV
C05	22448221	220μF 50 WV
C06	22446221	220μF 25 WV
C07	22446221	220μF 25 WV
C08	22430019	1000μF 35 WV
C09,10	22340030	0.01μF 500V CK
C11,12	22340030	0.01μF 500V CK
C13,14	22340030	0.01μF 500V CK
C15	22447101	100μF 35 WV
D01	22115146	5B-2
D02	37682020	1D-2C1
D03	31110142	1S142
TR01	31240235	2SD235-0

MISCELLANEOUS

SYMBOL	CORD NO.	DESCRIPTION
	22116080	Transistor Socket (4 Used)
J01,02	22167138	AC Receptacle (2 Used)
J09	22167131	DIN Socket
	22164311	Short Pin Plug (2 Used)
	22163361	US Pin Jack, 1 Pin
	22163343	US Pin Jack, 4 Pin (3 Used)
J05,06	22162260	Speaker Terminal (2 Used)
J08	22162259	Antenna Terminal
	22162258	Earth Terminal
S5,6	22148605	Circuit Breaker 3.15A, Speaker Protector (2 Used)
S4	22148602	Circuit Breaker 2.5 A, AC Line Protector
S12	22146504	Slide SW, 6C-2P
	22213806	Power Trans, PT8014
	22176221	Power Cord, EP
	22167243	Fuse Lamp Socket (5 Used)
J8	22167145	Voltage Selector
	22160016	PWB Connector, 14 pin
S1	22146516	Rotary Sw, Selector
S2	22146515	Rotary Sw, Mode
S3	22146514	Rotary Sw, Power
S7	22146502	Lever Sw, 4C-2P
	22145995	Lever Sw, 2C-2P
	22163175	Headphone Jack
PL01~05	22113211	Pilot Lamp, 8 V 0.3A (5 Used)
	22113212	Pilot Lamp, 8 V 50 mA
PL06	22113201	Stereo Indicator, 6 V 30 mA
M01	22104177	Tuning Meter
F02,03	22144187	Fuse, 1.2A (2 Used)
F01	22144139	Fuse, 2.0A

CHASSIS PARTS LIST

COMMON

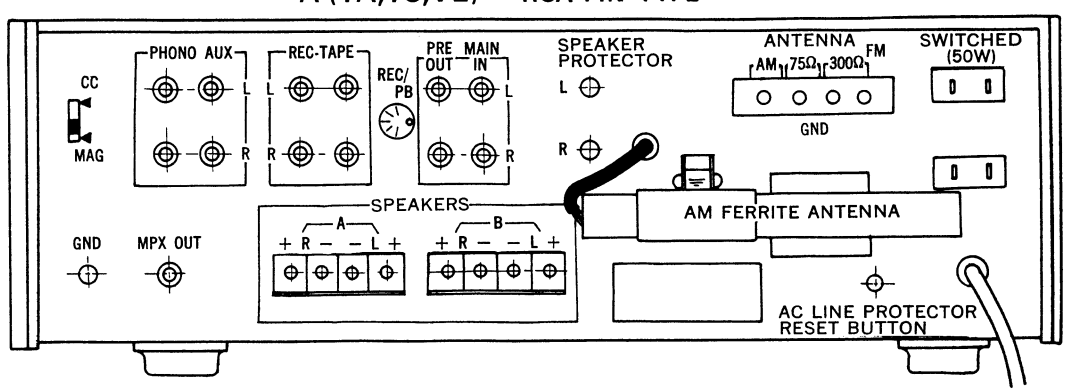
SYMBOL	CORD NO.	DESCRIPTION
	22116080	Transistor Socket (4 used)
	22164311	Short Pin Plug (2 used)
	22163361	US Pin Jack 1 pin
	22163343	US Pin Jack 4 pin (3 used)
	22162258	Earth Terminal
S5, 6		Circuit Breaker 3.15A
	22148605	Speaker Protector (2 used)
S4	22148602	Circuit Breaker 2.5A
		AC Line Protector
S12	22146504	Slide SW 6C-2P
	22213806	Power Trans PT8014
	22167243	Fuse Lamp Socket (5 used)
	22167145	PWB Connect 14 pin
S1	22146516	Rotary SW Selector
S2	22146515	Rotary SW Mode
S3	22146514	Rotary SW Power
S7	22146502	Lever SW 4C-2P
	22145995	Lever SW 2C-2P
	22163175	Head phone Jack
PL01-05	22113211	Pilot Lamp 8V 0.3A (5 used)
	22113212	Pilot Lamp 8V 50mA
PL06	22113201	Stereo Indicator 6V 30mA
M01	22104177	Tuning Meter
F01	22144139	Fuse 2.0A
F02,03	22144187	Fuse 1.2A (2 used)

DIFFERENCE

SYMBOL	CORD NO.	DESCRIPTION
	A(TA,TC,VL)	
J01,02	22167138	AC Receptacle (2 used)
J09	22167131	Din Socket 5P
J05,06	22162260	Speaker Terminal (2 used)
J08	22162259	Antenna Terminal
	22176221	Power Cord EP
	B (DTE)	
	22176286	Power Cord
J11,12,13	22167273	Din Socket 5P (3 used)
	22167245	Din AM Antenna Socket
	22163169	Din FM Antenna Socket
	22167163	Din SP Terminal (4 used)

JACK BOARD

A (TA,TC,VL) RCA PIN TYPE



B(DTE) DIN CONNECTOR TYPE